OPTIMUM®
MASCHINEN - GERMANY

Operating Manual

Version 1.0.7

Lathe

OPTI turn® TZ 4

Part no. 3432242

EN

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Preface

Dear customer,

Thank you very much for purchasing a product made by OPTIMUM.

OPTIMUM metal working machines offer a maximum of quality, technically optimum solutions and convince by an outstanding price performance ratio. Continuous enhancements and product innovations guarantee state-of-the-art products and safety at any time.

Before commissioning the machine please thoroughly read these operating instructions and get familiar with the machine. Please also make sure that all persons operating the machine have read and understood the operating instructions beforehand.
Keep these operating instructions in a safe place nearby the machine.

Information

The operating instructions include indications for safety-relevant and proper installation, operation and maintenance of the machine. The continuous observance of all notes included in this manual guarantee the safety of persons and of the machine.

The manual determines the intended use of the machine and includes all necessary information for its economic operation as well as its long service life.

In the paragraph "Maintenance" all maintenance works and functional tests are described which the operator must perform in regular intervals.

The illustration and information included in the present manual can possibly deviate from the current state of construction of your machine. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the machine may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability of the machine.
Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved!

Your suggestion with regard to these operating instructions are an important contribution to optimising our work which we offer to our customers. For any questions or suggestions for improvement, please do not hesitate to contact our service department.

If you have any further questions after reading these operating instructions and you are not able to solve your problem with a help of these operating instructions, please contact your specialised dealer or directly the company OPTIMUM.

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1 Safety

Glossary of symbols

►	provides further instructions
→	calls on you to act
O	listings

This part of the operating instructions

- O explains the meaning and use of the warning notes included in these operating instructions,
- O defines the intended use of the lathe,
- O points out the dangers that might arise for you or others if these instructions are not observed,
- O informs you about how to avoid dangers.

In addition to these operation instructions, please observe

- O the applicable laws and regulations,
- O the statutory provisions for accident prevention,
- O the prohibition, warning and mandatory signs as well as the warning notes on the lathe.

European standards must be observed during the installation, operation, maintenance and repair of the lathe.

If European standards have not yet been incorporated in the national legislation of the country of destination, the specific applicable regulations of each country must be observed.

If applicable, necessary measures must be taken to comply with the country-specific regulations before commissioning the lathe.

Always keep this documentation close to the lathe.

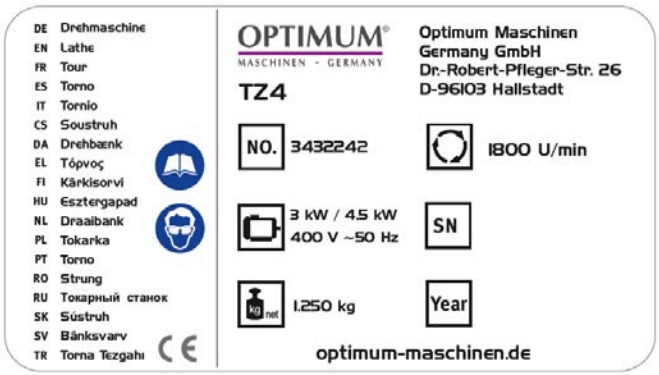
If you would like to order another operating manual for your machine, please indicate the serial number of your machine. The serial number is located on the type plate.

INFORMATION

If you are unable to rectify an issue using these operating instructions, please contact us for advice:

Optimum Maschinen Germany GmbH
Dr. Robert-Pfleger-Str. 26
D-96103 Hallstadt, Germany
Email: info@optimum-maschinen.de

1.1 Rating plate



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1.2 Safety instructions (warning notes)

1.2.1 Classification of hazards

We classify the safety warnings into different categories. The table below gives an overview of the classification of symbols (ideogram) and the warning signs for each specific danger and its (possible) consequences.

Symbol	Signal word	Definition / consequence
	DANGER!	Impending danger that will cause serious injury or death to people.
	WARNING!	A danger that can cause serious injury or death.
	CAUTION!	A danger or unsafe procedure that can cause personal injury or damage to property.
	ATTENTION!	Situation that could cause damage to the lathe and the product and other types of damage. No risk of injury to persons.
	INFORMATION	Practical tips and other important or useful information and notes. No dangerous or harmful consequences for people or objects.

In case of specific dangers, we replace the pictogram with

general danger

with a warning of

injuries to hands,

hazardous electrical voltage,

or

rotating parts.

1.2.2 Other pictograms

Warning: danger of slipping!

Warning: risk of stumbling!

Warning: hot surface!

Warning: biological hazard!

Warning: automatic start-up!

Warning: tilting danger!

Warning: suspended loads!

Caution, danger of explosive substances!

Switching on forbidden!

Do not climb onto the machine!

Read the operating instructions before commissioning!

Pull out the mains plug!

Wear protective glasses!

Wear protective gloves!

Wear safety shoes!

Wear a protective suit!

Use ear protection!

Only switch when stopped!

Protect the environment!

Contact address

1.3 Intended use

WARNING!

Improper use of the lathe

- **will endanger personnel,**
- **will endanger the lathe and other material property of the operator,**
- **the correct function of the lathe may be affected.**

The lathe was constructed for the longitudinal and face turning of round or regularly shaped workpieces of cold metal with a diameter and weight within the limits of the specified technical data. The lathe must only be installed and operated in a dry and ventilated place. The machine integrated coolant system is only intended for water-miscible cooling lubricants.

The lathe is designed and manufactured to be used in environments where there is no potential danger of explosion.

If the lathe is used in any way other than described above, or modified without the approval of Maschinen Germany GmbH, then the lathe is being used improperly.

We will not be held liable for any damages resulting from any operation which is not in accordance with the intended use.

We expressly point out that the guarantee or CE conformity will expire, if any constructive, technical or procedural changes are not performed by the company Optimum Maschinen Germany GmbH.

It is also part of the intended use that you

- observe the limits of the lathe,
- observe the operating instructions,
- and comply with the inspection and maintenance instructions.

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► Technical specification on page 20

In order to achieve optimum cutting performance, it is essential to choose the right turning tool, feed, tool pressure, cutting speed and coolant.

WARNING!

Extremely severe injuries due to non-intended use.

It is forbidden to make any modifications or alternations to the operation values of the lathe. They could endanger the personnel and cause damage to the lathe.

1.4 Reasonably foreseeable misuses

Any other use other than that specified under “Intended use” or any use beyond the described use shall be deemed as non-intended use and is not permissible.

Any other use has to be discussed with the manufacturer.

The lathe must not be used to process metal, cold and non-inflammable materials.

In order to avoid misuse, it is necessary to read and understand the operating instructions before the first commissioning.

The operators must be qualified.

1.4.1 Avoiding misuse

→ Use of suitable cutting tools.

→ The operating speed of the lathe may not exceed the permissible speed of the used clamping device.

→ Adapting the speed adjustment and feed to the material and workpiece.

→ Insert the workpiece tightly, without vibration and without one-sided imbalances.

→ The machine is not designed for the use of hand tools (e.g. emery cloth or files). It is forbidden to use any hand tools on this machine.

→ The machine is not designed to allow long parts to protrude beyond the spindle hole. If longer parts have to protrude beyond the spindle hole, an additional operator-side, permanent device must be mounted, which completely covers the protruding part and provides complete protection against spinning parts.

→ Long workpieces must be propped up. Use the steady rest or follow rest in conjunction with the tailstock spindle to support longer parts and prevent the workpiece from flapping around and flying away.

→ Risk of fire and explosion due to the use of flammable materials or cooling lubricants. Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit), it is necessary to take additional preventive measures in order to avoid health risks.

→ When processing carbons, graphite and carbon-fibre-reinforced carbons, the machine is no longer being used as intended. When processing carbons, graphite and carbon-fibre-reinforced carbons and similar materials, the machine can be damaged quickly, even if the dusts generated are completely sucked out during the work process.

→ The processing of plastics with the lathe leads to static charge. The static charge of machine parts from processing plastics cannot be safely conducted away from the lathe.

→ When using lathe dogs as carriers for rotating workpieces between the lathe centres, the standard lathe chuck shield must be replaced with a circular lathe chuck shield.

1.5 Potential dangers that can be caused by the lathe

The lathe has been tested for operational safety. The construction and type are state of the art.

Nevertheless, there is a residual risk as the lathe operates with

O high revolutions,

- with rotating parts,
- electrical voltage and currents,

We have used design and safety engineering to minimize the health risk to personnel resulting from these hazards.

If the lathe is used and maintained by personnel who are not duly qualified, there may be a risk resulting from incorrect or unsuitable maintenance of the lathe.

INFORMATION

Everyone involved in the assembly, commissioning, operation and maintenance must

- be duly qualified,
- and strictly follow these operating instructions.

In the event of improper use

- there may be a risk to personnel,
- there is a risk of damage to the lathe and other property,
- the correct function of the lathe may be affected.

Always disconnect the lathe, when cleaning or maintenance work is being carried out.

WARNING!

The lathe may only be used with the safety devices activated. Disconnect the lathe immediately whenever you detect a failure in the safety devices or when they are not mounted!

All additional devices installed by the operator have to be equipped with the prescribed safety devices. As the operating company, this is your responsibility!

► **Safety devices on page 13**

1.6 Qualification of personnel

1.6.1 Target group

This manual is addressed to

- the operating companies,
- the operators,
- the maintenance personnel.

Therefore, the warning notes refer to both the operation and maintenance of the lathe.

Determine and indicate clearly who will be responsible for the different activities on the lathe (operation, maintenance and repair).

Unclear responsibilities constitute a safety risk!

Always disconnect the main plug of the lathe and secure the main switch using a lock. This will prevent it from being used by unauthorized persons.

The qualifications of the personnel for the different tasks are mentioned below:

Operator

The operator has been instructed by the operating company regarding the assigned tasks and possible risks in case of improper behaviour. Any tasks which need to be performed beyond the operation in standard mode must only be performed by the operator, if so indicated in these instructions and if the operator has been expressively commissioned by the operating company.

Qualified electrician

With professional training, knowledge and experience as well as knowledge of respective standards and regulations, qualified electricians are able to perform work on the electrical system and recognise and avoid any possible dangers.

Qualified electricians have been specially trained for the working environment, in which they are working and know the relevant standards and regulations.

Qualified personnel

Because of their specialist training, knowledge and experience as well as their understanding of the relevant regulations, qualified personnel is capable of carrying out tasks assigned to them and recognise and avoid potential hazards without supervision.

Instructed person

Instructed persons were instructed by the operating company regarding the assigned tasks and any possible risks of improper behaviour.

1.6.2 Authorized persons

WARNING!

Inappropriate operation and maintenance of the lathe constitutes a danger for the personnel, objects and the environment.

Only authorized personnel may operate the lathe!

Persons authorized to operate and maintain should be trained technical personnel and instructed by the ones who are working for the operating company and for the manufacturer.

1.6.3 Obligations of the operating company

The operator must instruct the personnel at least once a year regarding

- all safety standards that apply to the lathe.
- the operation,
- generally accepted engineering standards.

The operating company must also

- check the personnel‘s knowledge level,
- document the training/instruction,
- have attendance at the training/instruction confirmed by signature and
- check whether the personnel is working in a safety and risk-conscious manner and following the operating instructions.
- Define and document the machine inspection deadlines in accordance with section 3 of the Factory Safety Order and perform an operational risk analysis in accordance with section 6 of the Safety at Work Act.

1.6.4 User's obligations

The operator must

- have read and understood the operating manual,
- be familiar with all safety devices and regulations,
- be able to operate the lathe.

1.6.5 Additional requirements regarding the qualification

Additional requirements apply for work on electrical components or equipment:

- They must only be performed by a qualified electrician or person working under the instructions and supervision of a qualified electrician.

Before starting work on electrical parts or operating agents, the following actions must be taken in the order given:

→ disconnect all poles,

→ secure against restarting,

→ check that there is no voltage.

1.7 Operator positions

The operator position is in front of the lathe.

1.8 Safety measures during operation

CAUTION!

Danger due to inhaling dust and mist that is hazardous to health.

Dependent on the material which need to be processed and the used auxiliaries dusts and mist may be caused which might impair you health.

Make sure that the generated health hazardous dusts and mist are safely sucked off at the point of origin and is dissipated or filtered from the working area. To do so, use a suitable extraction unit.

CAUTION!

Risk of fire and explosion by using flammable materials or cooling lubricants.

Before processing inflammable materials (e.g. aluminium, magnesium) or using inflammable auxiliary materials (e.g. spirit) it is necessary to take additional preventive measures in order to safely avoid health risks.

CAUTION!

Risk of becoming entangled or lacerations when using hand tools.

The machine is not designed for the use of hand tools (e.g. emery cloth or files). It is forbidden to use any hand tools on this machine.

1.9 Safety devices

Use the lathe only with properly functioning safety devices.

Stop the lathe immediately if there is a failure on the safety device or if it is not functioning for any reason.

It is your responsibility!

If a safety device has been deactivated or is defective, the lathe can only be used again if you

- the cause of the fault has been eliminated,
- you have verified that there is no danger to personnel or objects.

WARNING!

If you bypass, remove or override a safety device in any other way, you are endangering yourself and other persons working on the lathe. The possible consequences are:

- **injuries due to components or workpieces flying off at high speed,**
- **contact with rotating parts and**
- **fatal electrocution,**
- **pulling-in of clothes.**

The lathe includes the following safety devices:

- a lockable main switch,
- an emergency stop button,
- a lathe chuck protection with position switch,
- a protective cover on the headstock with position switch,
- a DC brake of the driving motor,
- protective covers on the machine bed,
- a safety screw at the tailstock,
- a protective cover on the lead screw an feed rod,
- a chips shield.

WARNING!

The protective equipment for material separation that is made available and delivered together with the machine is designed to reduce the risk of workpieces or fractions of them being expelled from the machine, but not to remove them entirely.

1.9.1 Lockable main switch

WARNING!

Dangerous voltage even if the main switch is switched off.

The areas marked by the pictogram might contain live parts, even if the main switch is switched off.

In the "0" position, the lockable main switch can be secured against accidental or non-authorised switching on by means of a padlock.

The power supply is interrupted by switching off the main plug.

Except for the areas marked by the pictogram in the margin. In these areas there might be voltage, even if the main switch is switched-off.

1.9.2 Emergency stop button

CAUTION!

The drive or the lathe chuck will continue to run for a while, depending on the mass moment of inertia of the lathe chuck and the workpiece.

The emergency stop button brings the machine to a standstill.

Turn the knob to the right to unlock and release the emergency stop button.

CAUTION!

Only press the emergency stop button in a genuine emergency. Do not use the emergency stop button to stop the machine during normal operation.

By activating the emergency stop, the drive controls are shut off.

1.9.3 Protective cover of the headstock

The headstock of the lathe is equipped with a separating protective cover and a interlock switch. The machine only starts when the protective cover is closed.

WARNING!

Only remove the protective cover when the main switch of the lathe is turned off and secured by a padlock.

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1.9.4 Protective covers of drive

The machine bed of the lathe is equipped with permanently installed safety covers. The screws are properly connected with the covers and therefore can not be lost.

DANGER!

The machine may only be started back up when all safety covers have been installed and screwed on tightly.

1.9.5 Lathe chuck protection with position switch

The lathe is equipped with a lathe chuck protection. The lathe can only be switched on if the lathe chuck protection is closed.

1.9.6 Chip guard shield

Polycarbonate windows

Polycarbonate viewing window in chip protection, must be visual inspected by the customer responsible personnel at regular intervals to guarantee the operational safety of the machine.

Polycarbonate viewing panes are subject to an ageing process and are classified as wear parts.

The aging of polycarbonate windows can not be detected by visual inspection. It is therefore necessary to replace the polycarbonate windows after a certain time.

Prolonged exposure from polycarbonate windows to cutting fluids can lead to accelerated ageing, i.e. deterioration of the mechanical properties (brittleness). Coolant vapours, detergents, greases and oils or other corrosive substances from the operator side can also lead to a deterioration of the polycarbonate windows. The result is a reduced retention capability of the polycarbonate viewing pane against chips and potentially flying parts.

1.9.7 Prohibition, warning and mandatory signs

INFORMATION

All warning and mandatory signs must be legible. They must be checked regularly.

1.10 Safety check

Check the lathe at least once per shift. Inform the person responsible immediately of any damage, defects or changes in the operating function.

Check all safety devices

- O at the beginning of each shift (with the machine stopped),
- O once a week (with the machine in operation),
- O after all maintenance and repair work.

Check that prohibition, warning and information signs and the labels on the lathe

- O are legible (clean them, if necessary)
- O are complete.

INFORMATION

Organise the checks according to the following table;

General check		
Equipment	**Check**	**OK**
Guards	Mounted, firmly bolted and not damaged	
Signs, Markings	Installed and legible	
Date:	**Checked by (signature):**	

Functional check	
Equipment	**Check**
EMERGENCY-STOP mushroom switch	After activating the emergency stop mushroom button, the drive on the lathe will shut off. The spindle continues to rotate for a while, depending on the mass moment of inertia of the spindle and workpiece.
Positions switch Lathe chuck protection	The spindle drive of the lathe must only be switch on if the lathe chuck protection is closed.
Positions switch Protective cover of the headstock	The spindle drive of the lathe must only be switch on if the protective cover of the headstock is closed.
Date:	**Checked by (signature):**

1.11 Personal protective equipment

For certain work personal protective equipment is required.

Protect your face and your eyes: Wear a safety helmet with facial protection when performing work where your face and eyes are exposed to hazards.

Wear protective gloves when handling pieces with sharp edges.

Wear safety shoes when you assemble, disassemble or transport heavy components.

Use ear protection if the noise level (emission) in the workplace exceeds 80 dB (A).

Before starting work make sure that the required personal protective equipment is available at the work place.

CAUTION!

Dirty or contaminated personnel protective equipment can cause illness.

It must be cleaned after each use and at least once a week.

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1.12 Safety during operation

We provide information about the specific dangers when working with and on the lathe in the descriptions for these types of work.

WARNING!

Before activating the lathe ensure that this will neither endanger other persons nor cause damage to equipment.

Avoid any unsafe work methods:

- Make sure that your work does not endanger anyone.
- Clamp the workpiece tightly before activating the lathe.
- Observe the maximum lathe chuck opening.
- Wear safety goggles.
- Do not remove the turning chips by hand. Use a chip hook and / or a hand brush to remove turning chips.
- Clamp the turning tool at the correct height and with the least possible overhang.
- Turn off the lathe before measuring the workpiece.
- The instructions described in these operating instructions must be strictly observed during assembly, operation, maintenance and repair.
- Do not work on the lathe if your concentration is reduced, for example, because you are taking medication.
- Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities responsible for your company.
- Inform the supervisor about all hazards or faults.
- Stay at the lathe until all movements have come to a complete standstill.
- Use the prescribed personnel protective equipment. Make sure to wear a well-fitting work suit and, if necessary, a hairnet.

1.13 Safety during maintenance

Inform the operators in good time of any maintenance and repair works.

Report all safety-relevant changes and performance characteristics of the lathe. Any changes must be documented, the operating instructions updated and machine operators instructed accordingly.

1.13.1 Disconnecting and securing the lathe

Turn off the main switch of the lathe before starting any maintenance or repair work.

Use a padlock to prevent the switch from being turned on without authorization and keep the key in a safe place.

All machine parts as well as all dangerous voltages are switched off.

Excepted are only the positions which are marked with the adjoining pictogram. These positions may be live, even if the main switch is switched off.

Attach a warning sign to the lathe.

WARNING!

Live parts and moves of machine parts can injure you or others dangerously!

Proceed with extreme care if you cannot switch off
the lathe by turning off the main switch for necessary procedures (e.g. functional control).

1.13.2 Using lifting equipment

WARNING!

The use of unstable lifting and load suspension equipment that might break under load can cause severe injuries or even death.

Check to ensure that the lifting and load-suspension equipment are of sufficient load-bearing capability and are in perfect condition.

Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other supervisory authorities applicable to your company.

Fasten the loads properly.

Never walk under suspended loads!

1.13.3 Mechanical maintenance work

Remove or install protection safety devices before starting or after completing any maintenance work; this include:

- covers,
- safety instructions and warning signs,
- grounding cables.

If you remove protection or safety devices, refit them immediately after completing the work.

Check that they are working properly!

1.14 Accident report

Inform your supervisors and Optimum Maschinen Germany GmbH immediately in the event of accidents, possible sources of danger and any actions which almost led to an accident (near misses).

There are many possible causes for “near misses”.

The sooner they are notified, the quicker the causes can be eliminated.

INFORMATION

We provide information about the dangers of working with and on the lathe in these work descriptions.

1.15 Electronics

Have the machine and/or the electric equipment checked regularly. Immediately eliminate all defects such as loose connections, defective wires, etc.

A second person must be present during work on live components to disconnect the power in the event of an emergency. If there is a fault in the power supply, switch off the lathe immediately!

Comply with the required inspection intervals in accordance with the factory safety directive, operating equipment inspection.

The operator of the machine must ensure that the electrical systems and operating equipment are inspected with regards to their proper condition, namely,

- by a qualified electrician or under the supervision and direction of a qualified electrician, prior to initial commissioning and after modifications or repairs, prior to recommissioning
- and at set intervals.

The intervals must be set so that foreseeable defects can be detected in a timely manner, when they occur.

The relevant electro-technical rules must be followed during the inspection.

The inspection prior to initial commissioning is not required if the operator receives confirmation from the manufacturer or installer that the electrical systems and operating equipment comply with the accident prevention regulations, see conformity declaration.

Permanently installed electrical systems and operating equipment are considered constantly monitored if they are continually serviced by qualified electricians and inspected by means of measurements in the scope of operation (e.g. monitoring the insulation resistance).

1.16 Inspection deadlines

Define and document the inspection deadlines for the machine in accordance with § 3 of the Factory Safety Act and perform an operational risk analysis in accordance with § 6 of the Work Safety Act. Also use the inspection intervals in the maintenance section as reference values.

2 Technical specification

The following information represents the dimensions and indications of weight and the manufacturer‘s approved machine data.

2.1 Electrical connection	
	3 x 400V ~ 50 Hz (~60Hz) 6 kW
2.2 Drive motor power	
Motor drive power stage H	4.5 kW
Motor drive power stage L	3 kW
Operating mode, power-on time	S6 - 60%
2.3 Work areas	
Width of bed [mm]	260
Height of centres [mm]	200
Distance between centres [mm]	800
Swing diameter over machine bed [mm]	400
Swing diameter over lathe saddle [mm]	245
Main spindle bore [mm]	52
Maximum weight of workpiece between centers [kg]	160
2.4 Work area	Keep a work area of at least one metre around the machine free for operation and maintenance.
2.5 Headstock	
Main spindle nose ► Spindle holding fixture on page 38	DIN ISO 702 - 1 No. 5 - Form A2 (Short taper with screws from the front)
Internal taper of spindle nose	MT6
Reducing cone in the main spindle	MT6 / MT3
Spindle speeds [min^{-1}]	45 - 1800
Speed steps motor + gear drive	16
2.6 Feeds and pitches	
Longitudinal feeds [mm/rev]	0.0263 - 1.8416 (48 pcs.)
Cross feeds [mm/rev]	0.0133 - 0.9321 (48 pcs.)
Metric threads + metric special threads [mm / rev] Change gears for metric special threads are not included as standard.	0.2 - 14 (36 pcs.)
Inch threads [threads / inch] Change gears are not included as standard.	1 - 80 (42 pcs.)
Module threads [mm x π] Change gears (+ 33 teeth's)are included as standard.	0.1 -7 (44 pcs.)

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Diametrical pitch [threads / ᴨ] Change gears are not included as standard.	3 - 200 D.P (33 pcs.)
Lead screw	Ø24mm, 6mm pitch
2.7 Slides	
Travel cross slide [mm]	212
Scale on the handwheel cross slide	4mm/rev - splitting 0.05mm
Travel top slide [mm]	112
Scale on the handwheel top slide	3mm/rev - splitting 0.05mm
Swivel range top slide	+90° / - 65°
Scale on the handwheel lathe saddle	25mm/rev - splitting 0.1mm
2.8 Lead screw for thread cutting	
Travel cross slide [mm]	212
2.9 Tailstock	
Quill diameter [mm]	50
Quill travel [mm]	110
Taper in the quill	MT3
Scale on the handwheel tailstock	4mm/rev - splitting 0.05mm
Scale division at the quill	1mm
Cross adjustment	+ - 10mm
2.10 Quick action tool holder	
Type: SWH5 ► AM Schnellwechselhalter - Quick action tool holder on page 118	
2.11 Steady and follow rest	
Steady rest passage min. - max. [mm]	► Steady rest on page 43
Follow rest passage min. - max. [mm]	► Follow rest on page 43
2.12 Dimensions	► Installation plan on page 29
Total weight [kg]	1250
Total weight with packaging and accessories [kg]	1450
2.13 Coolant equipment	
Tank capacity	20 litres
Max. rate of flow	25 litres / min
Power of pump	0.125 KW

2.14 Environmental conditions	
Temperature	5 - 35 °C
Admissible relative humidity	25...80% no condensation
2.15 Operating material See also ► Lubricant on page 125	
Headstock, (DIN 51517 - CLP 68) Mobilgear 626 or a comparable oil	1.5 litres
Apron gear, (DIN 51517 - CLP 68) Mobilgear 626 or a comparable oil	3.5 litres
Feed gear, (DIN 51517 - CLP 68) Mobilgear 626 or a comparable oil	1.8 litres
bare metal parts, lubricating oilers, sliding tracks (DIN 51502 - CGLP 68) Mobil Vactra Oil No.2	
Coolant system, commercially available water-miscible cooling lubricants ► Lubricant on page 125	

2.16 Emissions

The airborne noise of the lathe is 75 to 80 dB (A) at the operator position and operating conditions in accordance with DIN ISO 8525 If the machine is installed in an area where various machines are in operation, the noise exposure (immission) on the operator of the drilling machine at the working place may exceed 85 dB(A).

INFORMATION

This numerical value was measured on a new machine under the operating conditions specified by the manufacturer. The noise behaviour of the machine might change depending on the age and wear of the machine. Furthermore, the noise emission also depends on production engineering factors, e.g. speed, material and clamping conditions.

INFORMATION

The specified numerical value represents the emission level and does not necessarily a safe working level. Though there is a dependency between the degree of the noise emission and the degree of the noise disturbance it is not possible to use it reliably to determine if further precaution measures are required or not.

The following factors influence the actual degree of the noise exposure of the operator:

- Characteristics of the working area, e.g. size of damping behaviour,
- other noise sources, e.g. the number of machines,
- other processes taking place in proximity and the period of time, during which the operator is exposed to the noise.

Furthermore, it is possible that the admissible exposure level might be different from country to country due to national regulations. This information about the noise emission should, however, allow the operator of the machine to more easily evaluate the hazards and risks.

CAUTION!

Depending on the overall noise exposure and the basic threshold values, machine operators must wear appropriate hearing protection.

We generally recommend the use of noise and ear protection.

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3 Delivery, interdepartmental transport, assembly and commissioning

3.1 Notes on transport, installation, commissioning

Improper transport, installation and commissioning is liable to accidents and can cause damage or malfunctions to the machine for which we do not assume any liability or guarantee.

Transport the scope of delivery secured against shifting or tilting with a sufficiently dimensioned industrial truck or a crane to the installation site.

WARNING!

Severe or fatal injuries may occur if parts of the machine tumble or fall down from the forklift truck or from the transport vehicle. Follow the instructions and information on the transport box.

Note the total weight of the machine. The weight of the machine is indicated in the "Technical data" of the machine. When the machine is unpacked, the weight of the machine can also be read on the rating plate.

Only use transport devices and load suspension gear that can hold the total weight of the machine.

WARNING!

The use of unstable lifting and load suspension equipment that might break under load can cause severe injuries or even death. Check that the lifting and load suspension gear has sufficient load-bearing capacity and that it is in perfect condition.

Observe the accident prevention regulations issued by your Employers Liability Insurance Association or other competent supervisory authority, responsible for your company. Fasten the loads properly.

3.1.1 General risks during internal transport

WARNING: TILTING DANGER!

The machine may be lifted unsecured by a maximum of 2 cm.

Employees must be outside the danger zone, i.e. the reach of the load.

Warn employees and advise them of the hazard.

Machines may only be transported by authorized and qualified persons. Act responsibly during transport and always consider the consequences. Refrain from daring and risky actions.

Gradients and descents (e.g. driveways, ramps and the like) are particularly dangerous. If such passages are unavoidable, special caution is required.

Before starting the transport check the transport route for possible danger points, unevenness and faults.

Danger points, unevenness and disturbance points must be inspected before transport. The removal of danger spots, disturbances and unevenness at the time of transport by other employees leads to considerable dangers.

Careful planning of interdepartmental transport is therefore essential.

3.2 Delivery

INFORMATION

The machine is pre assembled. It is delivered in a transport box. After the unpacking and the transportation to the installation site it is necessary to mount and assemble the individual components of the machine.

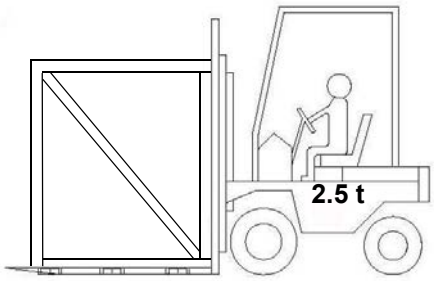
Check the status of the machine immediately upon receipt and claim possible damages at the last carrier also if the packing is not being damaged. In order to ensure claims towards the freight carrier we recommend you to leave the machines, devices and packing material for the time being in the status at which you have determined the damage or to take photos of this status. Please inform us about any other claims within six days after receipt of delivery.

The default accessory which is mounted on the change gear bar, contains the change gears for producing metric threats and module threats. Change gears for producing inch or D.P. threats must be ordered separately.(Part no.3444160)

The handlebars of the handwheels are in the accessory-tool box.

3.3 Transport

m ► „ Total weight with packaging and accessories [kg]“ on page 21



3.4 Load attachment points

The machine can be lifted underneath the machine substructure using a forklift or lift truck. The bedslide and the tailstock must be driven to the end of the machine bed in order to achieve a balanced load.

3.5 Installation and assembly

ATTENTION!

Before you install the machine have the load-bearing capacity of the floor checked by an expert. The floor and/or the hall ceiling must carry the weight of the machine including all components and additional sets, operators and material on stock. The underground might have to be reinforced.

3.5.1 Requirements regarding the installation site

In order to achieve sufficient safety against falls by slipping, the accessible area in the mechanical machining zone of the machine must be equipped with a slip resistance. The slip resistant mat and/or the slip resistant floor must be at least R11 according to BGR 181.

The used shoes must be suitable for being used in those machining areas. The accessible areas must be cleaned.

Organize the working area around the lathe according to the local safety regulations.

The work area for operation, maintenance and repair must not be restricted.

INFORMATION

In order to attain good functionality and a high processing accuracy as well as a long service life of the machine, the place of installation should fulfil certain criteria.

Please observe the following points:

- The machine must only be installed and operated in a dry and well-ventilated place.
- Avoid places near machines generating chips or dust.
- The installation site must be free from vibrations also at a distance of presses, planing machines, etc.
- The ground must be suitable for the lathe. Make sure that the floor has sufficient load-bearing capacity and is level.
- The ground must be prepared in a way that potential coolants cannot penetrate the floor.
- Any parts sticking out such as stops, handles, etc. have to be secured by measures taken by the customer if necessary in order to avoid endangering persons.
- Provide sufficient space for the personnel preparing and operating the machine and transporting the material.
- Also make sure the machine is accessible for setting and maintenance works.

INFORMATION

The main switch of the lathe must be freely accessible.

3.6 Cleaning the machine

ATTENTION!

Do not use compressed air to clean the machine.

Your new lathe must be completely cleaned after being unpacked to make sure that all the moving parts and sliding surfaces are not damaged when the machine is operated. Each unit leaves the factory with all its polished parts and sliding surfaces suitably greased to avoid oxidation in the period of time that elapses, until it is started up. Remove all the wrapping and clean all the surfaces with a degreaser to soften and remove the protecting greases and coatings.

Clean all the surfaces with a clean cotton cloth and lubricate the lathe as explained in the following section, before connecting the power and beginning to operate the machine.

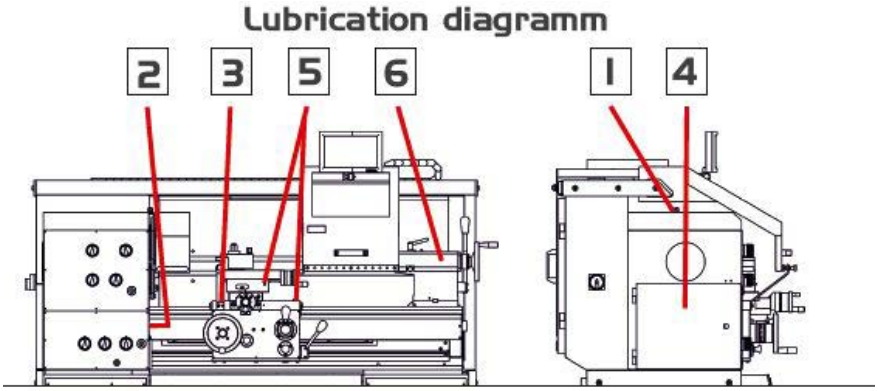
3.6.1 Lubrication

The lubrication and initial greasing of your new lathe consists of checking the oil levels through the headstock, apron and feed box oil sight glasses. The oil tanks must be filled to half way up the sight glass. In addition, all the points indicated in the enclosed drawing must be lubricated before moving the slides. Once these operations have been carried out, the machine can be started up.

→ The headstock, feed box and apron oil must be changed 50 hours after being filled for the first time, then after every 2000 hours of operation.

→ Use the oil types recommended in the reference table . The table shows a list of well-known companies and brands for oils that meet our specifications. This table can be used to compare the characteristics of each different type of oil of your choice.
► „ Lubricant“ on page 125

→ The lubrication nipples must be lubricated every 8 hours using an oiler. Furthermore, it is also recommended to lubricate the slide tracks of the machine bed once a day.



	1	2	3	4	5	6
Check		8 h				
Fill the oil	2000 h			8 h		
Liter	1.5	1.8	3.5	3 x Hub		
Oil	DIN 51517 CLP 68		DIN 5502 CGLP 68			

3.7 One-component paint

The machine is lacquered with a one-component paint. Observe this fact when selecting your cooling lubricant and cleaning of the machine.

A one-component lacquer with solvent part hardens when the solvent evaporates.

As soon as the lacquer is applied the solvent evaporates into the air. The binder becomes felted and a dry film is formed. This process is reversible, i.e. the binder can be etched again and again.

Two-component lacquer also consists of binder and solvent. However, the lacquer dries only in connection with an added hardener. This process is not reversible, i.e. the binder cannot be etched again and again.

The company Optimum Maschinen Germany GmbH does not assume any guarantee for subsequent damages due to unsuitable cooling lubricants.

3.8 Installation and assembly

ATTENTION!

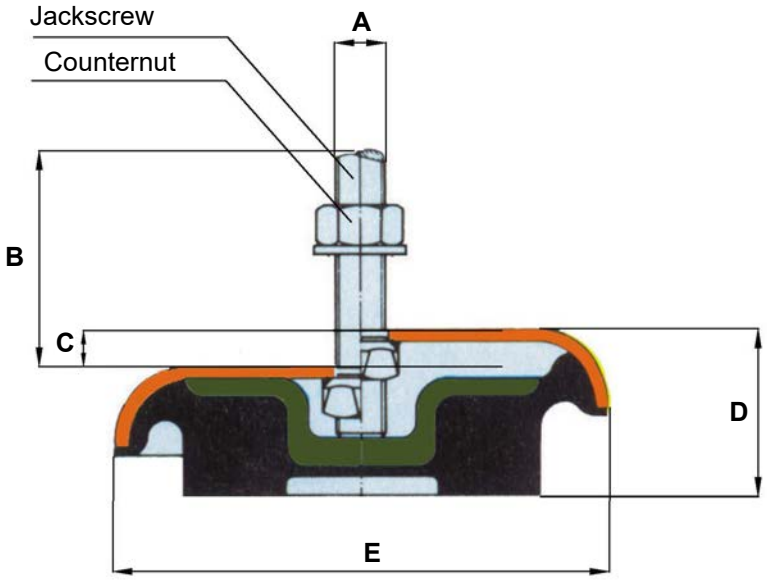
Make sure that only experienced personnel transported the machine, sets up and mounted.

3.8.1 Anchor-free assembly

Attaching a solid surface at each contact point between the foundation and machine base or use of vibration dampers type SE1, part no. 3381012 The 8 pcs. SE1 vibration dampers are fixed on the 8 pcs. 15mm through holes of the machine base. The maximum height adjustment per element is 10mm. Tighten the jackscrew, the vibration damper lifts up.

Drawing ► Anchor-free assembly on page 29

3.8.2 Dimension of vibration damper



	A	B [mm]	C [mm]	D [mm]	E [mm]
SE1	M12	70	10	32	120
SE2	M16	90	12	35	160
SE3	M20	130	12	40	185

ATTENTION!

Insufficient rigidity of the ground leads to superposition of vibrations between the lathe and the ground (natural frequency of the components). Critical speeds with unpleasant vibrations are rapidly achieved if the rigidity of the whole system is insufficient; this will lead to bad turning results.

3.8.3 Anchored assembly

→ Core drillings are carried out on a light foundation with a diameter of 120 to 150mm and a depth of 200mm.

→ The 8 pcs. Attach the prepared flat steels (50 x 120) with the anchor bolts in that way, that they are aligned with the anchor points.

→ Lift the machine from the ground and center the machine in the inner holes with the anchor bolts.

→ Align roughly the machine.

→ Fill the drill holes with concrete and allow it to set.

→ Align the machine with the levelling screws and tighten the anchor bolts.

Drawing ► Anchored assembly on page 28

3.8.4 Aligning of the machine

Once the bases are in place proceed to level according to the following description:

→ Place a machine spirit level (0.05 mm / m) onto the cross slide.

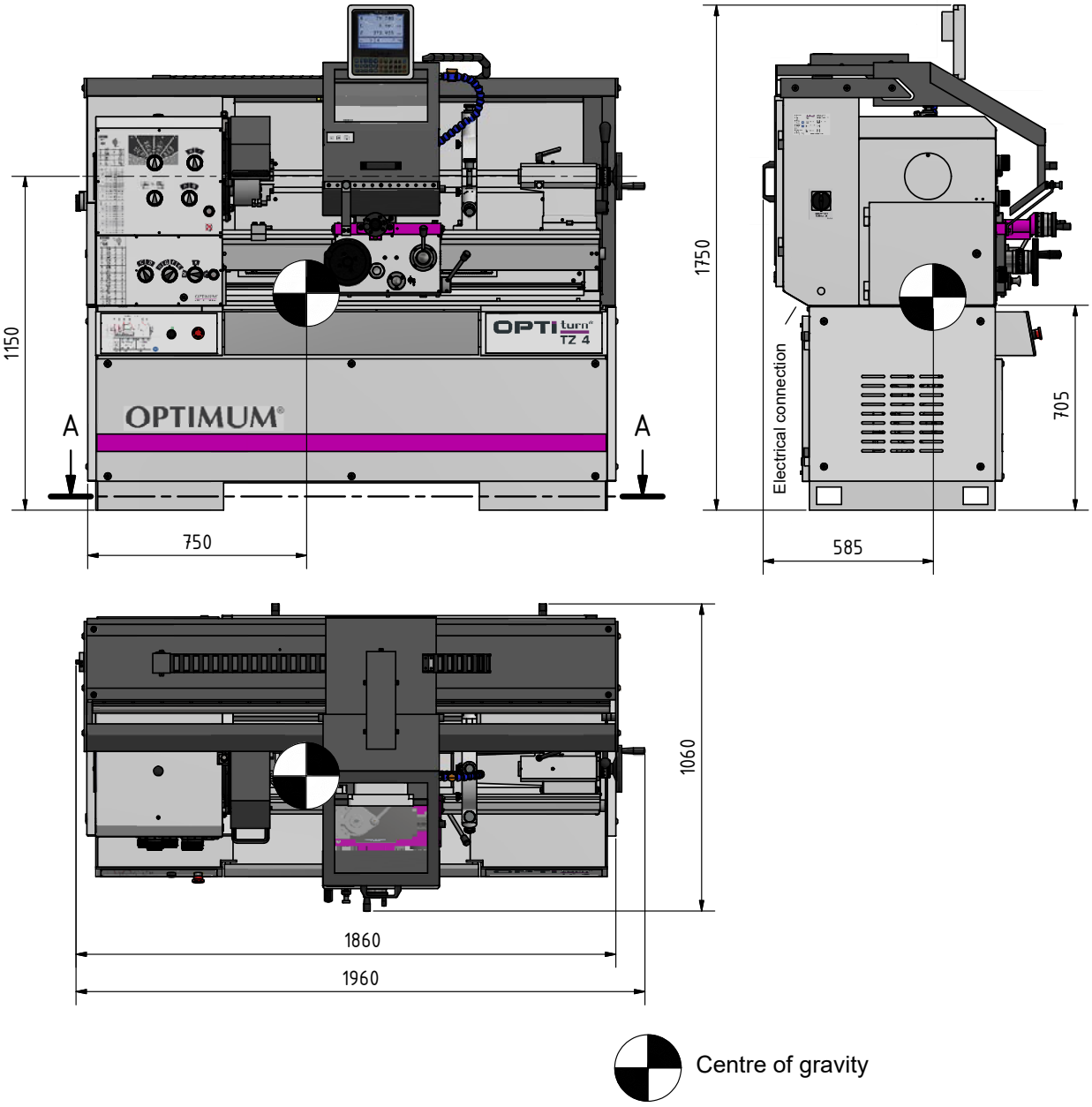
→ Position the carriage on the centre of the bed and by means of the end adjusting screws obtain a reading of 0.05 mm/m on the machine spirit level.

→ Move the carriage to the headstock and then to the tailstock and align the machine simultaneously with the adjusting screws until the machine spirit level shows a value of 0.05 mm / m.

→ Adjust the adjusting screws until they place pressure but do not vary the levelling.

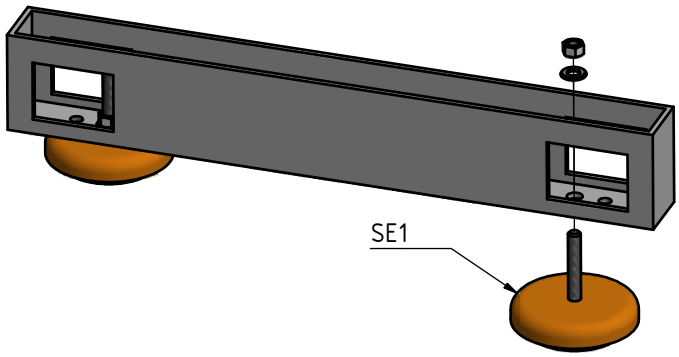
→ Lock with nuts and check the levelling again. Check that all the tightening devices are supported.

3.9 Installation plan



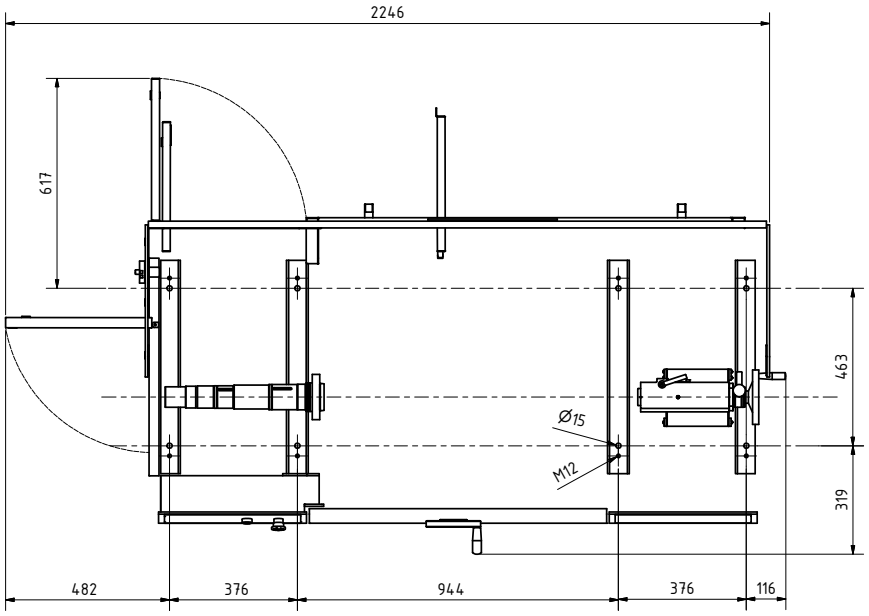
Centre of gravity

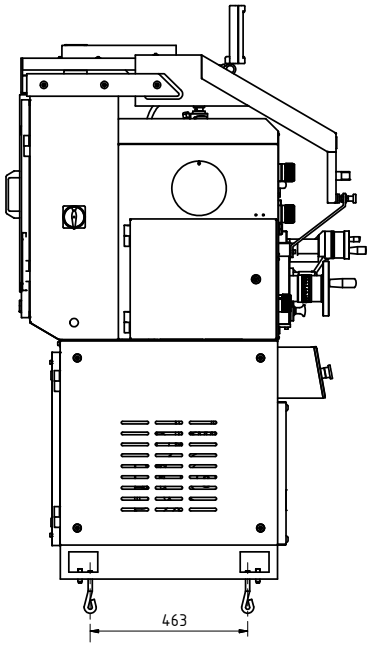
3.9.1 Anchor-free assembly

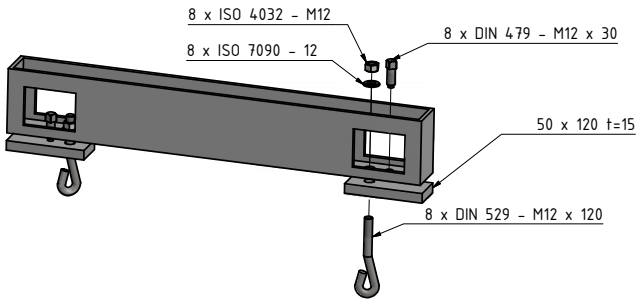


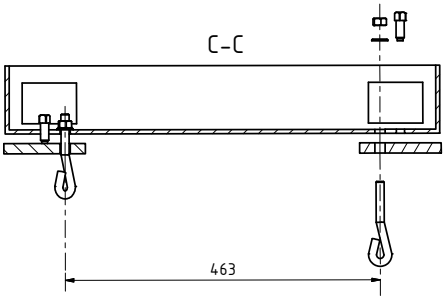
SE1 vibration dampers are not included as standard.

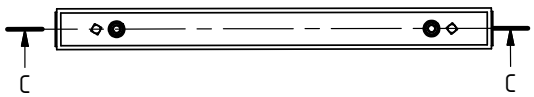
3.9.2 Anchored assembly











Anchor bolts, flat bars and levelling screws are not included as standard.

3.10 First commissioning

The machine may only be commissioned after proper installation.

WARNING!

There is a danger to persons and equipment, if the first commissioning carried out by inexperienced personnel. We do not assume any liability for damages caused by incorrectly performed commissioning.

WARNING!

Risk from using improper workpiece clamping materials or operating the machine at an inadmissible speed.

Only use the tool clamping devices (e.g. lathe chuck) that were delivered with the machine or those offered by OPTIMUM as optional equipment.

Only use tool clamping devices in the intended admissible speed range.

Workholding tools may only be modified in compliance with the recommendation of OPTIMUM or the clamping device manufacturer.

3.10.1 Power supply

→ Connect the electrical supply cable.

→ Check the fusing (fuse) of your power supply according to the technical instructions regarding the total connected power of the lathe.

CAUTION!

Position the power lead for the machine in such a manner that people cannot trip over it.

Please verify if the type of current, voltage and protection fuse correspond to the values specified. A protective earth ground wire connection must be available.

O Mains Fuse 16A , slow fuse.

ATTENTION!

Ensure that all 3 phases (L1, L2, L3) and the ground wire are connected correctly.

The neutral conductor (N) of its power supply is not connected.

ATTENTION!

Make sure that the direction of rotation of the drive motor and cooling lubricant pump is correct. If the rotational direction switch is switched to the down position, the lathe spindle must rotate anticlockwise. If necessary, two phase connectors at the three phase current switch or at the connection in the control cabinet must be exchanged. The guarantee will become null and void if the machine is connected incorrectly.

3.11 Turn and stop spindle rotation

Switch the rotation lever depending on the desired direction of rotation up or down. Switch in the neutral position to stop the machine.

3.11.1 Warming up the machine

ATTENTION!

If the lathe and in particular the lathe spindle are immediately operated at maximum load when cold, this may result in damages.

If the machine is cold, e.g. directly after having transported the machine, it should be warmed up at a spindle speed of only 500 1/min for the first 30 minutes.

4 Operation

4.1 Control and indicating elements

Pos.	Designation	Pos.	Designation
1	Speed selector switch	2	Change wheel and feed table
3	Control panel on headstock Direct run | Emergency Stop	4	Selector switch feed gear mechanism
6	Lathe chuck protection	7	Chip guard shield
8	Machine lamp	9	Digital Position Indicator
10	Tailstock	11	Control panel on chip guard Motor stage | Machine lamp | Coolant
12	Control panel on lathe saddle Engaging lever cross feed | longitudinal feed | thread cutting | manual pump central lubrication | handwheel lathe saddle | handwheel cross slide	14	Spindle rotation lever
15	Feed rod	16	Lead screw
17	Extensible chip sump		

4.2 Safety

Commission the lathe only under the following conditions:

- O The lathe is in proper working order.
- O The lathe is used as prescribed.
- O Follow the operating instructions.
- O All safety devices are installed and activated.

Eliminate or have all malfunctions rectified promptly. Stop the lathe immediately in the event of any abnormality in operation and make sure it cannot be started-up accidentally or without authorisation. Notify the person responsible immediately of any modification.

► Safety during operation on page 17

4.3 Switching the machine on

4.3.1 Switching on

→ Switch on the main switch.

→ Check that the emergency stop button is not pressed or is unlocked. Turn the emergency stop button to the right in order to unlock it.

→ Close the lathe chuck protection.

► Direct run on page 34

► Emergency stop button on page 14

► Cooling lubricant on page 64

► Malfunctions on page 127

4.4 Switching the machine off

→ Switch off the main switch.

→ If the lathe has been shut off for a longer period of time, switch it off using the main switch and secure it against being unintentionally switched back on. ► Emergency stop button on page 14

CAUTION!

The emergency stop button may only be activated in an emergency. You should not use the EMERGENCY STOP button to stop the machine during normal operation.

4.5 Resetting an emergency stop condition

→ Set the rotational direction control lever to the neutral position.

→ Unlock the emergency stop switch again.

4.6 Power failure, Restoring readiness for operation

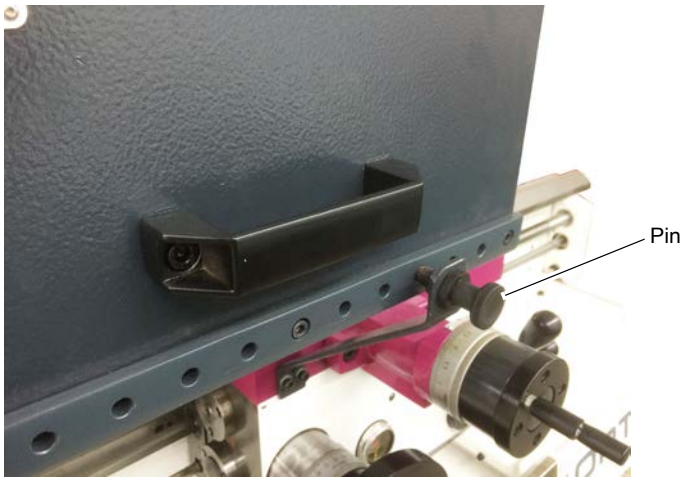
→ Set the rotational direction control lever to the neutral position.

4.7 Direct run

Use the direct run to facilitate engaging the gearbox settings. The spindle starts turning, while the direct run is activated. The lathe chuck protection must be closed for this. Press the direct run button only short.

4.8 Chip guard

Push the chip guard towards the lathe chuck and secure the position with a pin.



Img. 4-1: Chip guard

4.9 Gearbox settings and speed adjustment

4.9.1 Speed setting

DANGER!

Please observe the maximum permissible rotational speed when using a face plate and the maximum permissible speed when using chucks with individually clampable jaws.

INFORMATION

The face plate and four-jaw lathe chuck have individually clampable jaws. The individually clampable jaws on these tool carriers are constructive not designed to withstand high centrifugal forces. The centrifugal forces on the clamping jaws increases almost quadratically with increasing rotational speed. Clamping jaws may burst and be hurled out of the workpiece carrier at a high speed.

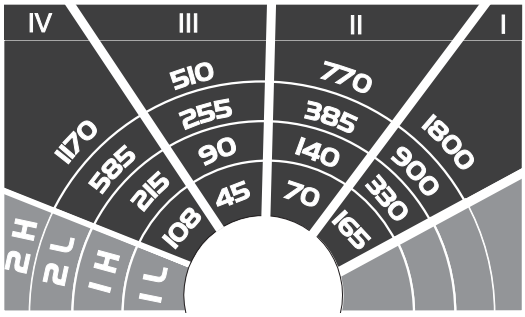
ATTENTION!

Only change gear positions when the lathe is being completely stopped.

Use the direct run to facilitate engaging the gearbox settings.

The machine is equipped with a two-stage drive motor.

- Switching the speed stage is performed with the keypad (H │ L) on the chip guard.
- Adjusting the gear stage takes place on the headstock.



Headstock (~50Hz spindle speeds)

Chip guard

Gear stage

4.10 Turning direction

The rotational direction of the machine is switched with the shift lever. The lathe can only be switched on, when the lathe chuck protection is closed.

→ Move the shift lever down if you want the turning direction to be anti-clockwise.

→ Move the shift lever up if you want the turning direction to be clockwise. Return run for thread cutting.

4.11 Feed

On apron:

The longitudinal feed is completely pulled out, the cross feed is completely pushed in. In the centre position, the feed is above the lead screw for thread cutting. Move the equivalent handwheel on the slide to allow for the engagement of the lever.

Longitudinal feed Cross feed Thread cutting

The force of the feed should not exceed 5 KN. The gear of the feed rod is equipped with shearing pins to protect against overloading. The apron contains a ball friction clutch.

On the headstock:

The selector levers on headstock are used to set the feed or the pitch required for the thread cutting.

ATTENTION!

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Only adjust the speed when the lathe is being completely stopped. If required, use the direct run to facilitate the engaging of the gear lever.

4.11.1 Feed force, turning till dog

CAUTION!

The maximum permissible feed speed in the longitudinal direction is 500mm/min and 250mm/min in the face direction.

Observe the location marker.

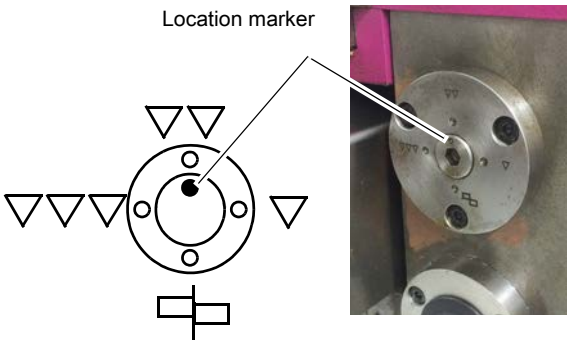
The apron is equipped with a drop worm. The drop worm allows for driving on a fixed dog in both movement directions.

After reaching the feed force set on the dial, the drop worm turns off the automatic feed and resets the engaging lever.

The dial is located on the left side of the apron and consists of three stages.

In the fourth stage, the feed is not automatically turned off, the drop worm is blocked. The feed is limited by the slip clutch in the apron.

The dial can be set using a 6 mm Allen wrench.



Meaning of symbols, feed force [N]:

1	▽▽▽	900 to 1200N
2	▽▽	1500 to 1800N
3	▽	2000 to 2500N
4	⊏	the feed is not automatically turned off above 4500 N.

ATTENTION!

The engaging lever must not be held, so the trigger mechanism can be used when turning to the dog.

4.11.2 Feed speed

Use the table on the lathe to adjust the rate of feed. ► Setting the feed on page 45

4.11.3 Feed direction

The selection lever is used to switch the direction of feed.

→ Turn the selector lever to the right or left, according to the symbols for machining with longitudinal feed in direction of the spindle head or for machining a thread.

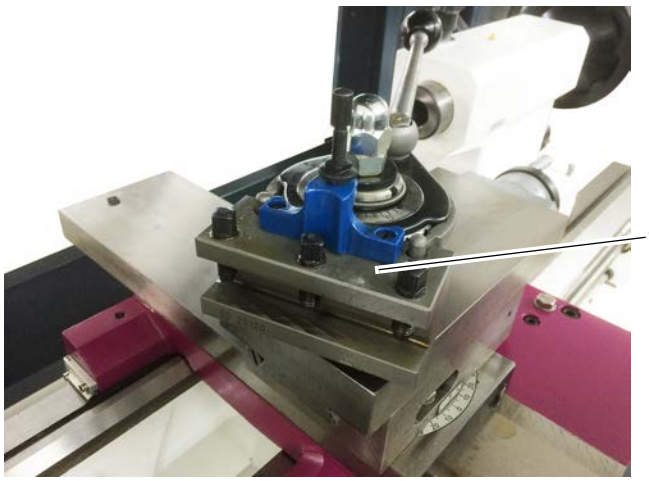
4.12 Quick action tool holder

Clamp the lathe tool into the quick action tool holder.

The lathe tool needs to be clamped as short and tight as possible when turning in order to be able to absorb the cutting force during the chip formation well and reliably.

Adjust the height of the lathe tool by means of the set screw on the tool holder. Counter the position of the tool holder by means of the knurled nut. Use the tailstock with the center point in

order to determine the required height. After having set the height, firmly tighten the quick action tool holder using the locking lever.



Img.4-2: Tool holder

Tool height

For the facing process, the cutting edge of the tool must be exactly aligned with the height of the lathe centre to obtain a shoulder-free face. The facing process is a turning operation in which the turning tool feeds perpendicular to the axis of rotation of the workpiece in order to produce a flat surface. The different methods are
transversal facing, transversal slicing and longitudinal facing.

Lathe tool angle

ATTENTION!

The lathe tool must be clamped with its axis perpendicular to the axis of the workpiece. If it is clamped at an angle, the lathe tool may be sucked into the workpiece.

4.13 Spindle holding fixture

WARNING!

Do not clamp any workpieces that exceed the permitted chucking capacity of the lathe chuck. The clamping force of the chuck is too low if its capacity is being exceeded. The clamping jaws may loosen.

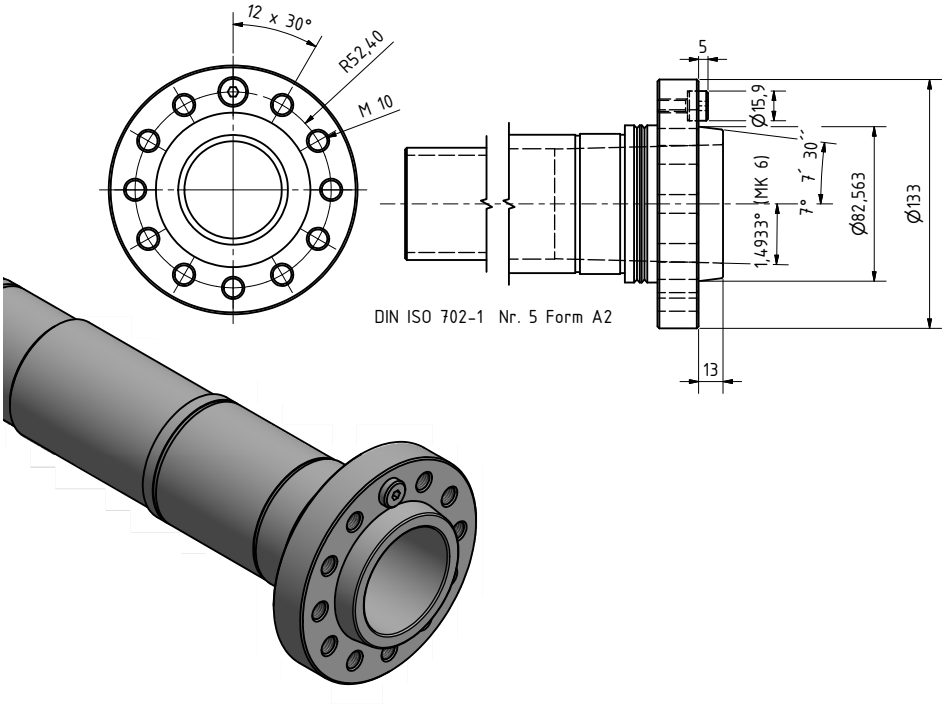
Only use lathe chucks designed for the speed of the machine.

Do not use lathe chucks with an external diameter that is too large.

Please ensure that lathe chucks are manufactured to EN 1550 standards.

The spindle has the size according to DIN ISO 702-1 form No.5, fixing screws from the front.

Regularly check the fixing screws of the lathe chuck to the spindle.



Img. 4-3: Spindle without lathe chuck

4.14 Lathe chuck

During turning, the workpiece is subject to cutting forces, weight forces and unbalance forces which have to be absorbed by a sufficiently strong clamping force. Massive workpieces with higher degrees of stiffness lead to a considerable loss of clamping force. This loss of clamping force is lower for thin-walled, distortion-sensitive workpieces with less stiffness.

The maximum rotational speed of a lathe chuck may only be applied at maximum actuating force and with perfectly working chucks.

Lathe chucks must be designed for the maximum rotational speed of the machine, the permissible lathe chuck speed with respective jaws and/or top jaws, as well as the maximum measured static clamping force at maximum introduced force must be specified in the operating instructions for the lathe chuck or be indicated on the lathe chuck itself. Lathe chucks must comply with EN 1550 standards. The minimum distance to the machine bed must not be less than 25 mm.

WARNING!

Do not clamp any workpieces that exceed the permitted chucking capacity of the lathe chuck. The clamping force of the chuck is too low if its capacity is being exceeded. The clamping jaws may loosen.

Only use lathe chucks designed for the speed of the machine.

Do not use lathe chucks with an external diameter that is too large.

Please ensure that lathe chucks are manufactured to EN 1550 standards.

4.14.1 Speed information, maintenance recommendations, reference speed

in accordance with DIN 6386

The reference speed is the number of rotations, at which the mathematical centrifugal force with the corresponding jaw design correlates with the greatest tensioning force when the machine is at a standstill. The reference speed applies for jaws mounted inside in tiers, whereby they must not protrude past the outer diameter of the chuck.

At the determined reference speed, 1/3 of the tensioning force which is available when the machine is at a standstill, is available for clamping the workpiece. The prerequisite is that the clamping chuck is in proper working order.

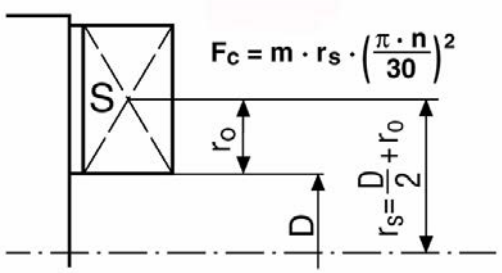
In general, the labels on the clamping jaws and lathe chuck (perm. speed, max. turning diameter, ...), the information in the respective lathe chuck operating instructions and, for special jaws, the additional information on the respective drawing must be observed.

The lathe chucks contained in your delivery cannot be used with top jaws.

4.14.2 Influencing factors that significantly impact the tensioning force

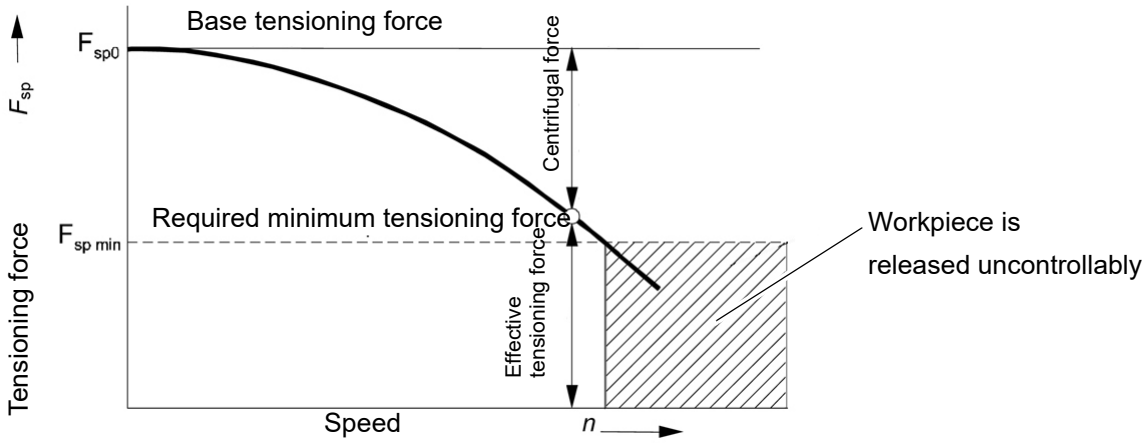
Clamping jaw centrifugal force

To calculate the required tensioning force for processing a workpiece, the centrifugal force of the clamping jaws must be taken into account.



Fc	Centrifugal force in N
m	Mass in kg/set
rs	Centre of gravity distance to the centre of the chuck in metres
n	Speed min^{-1}
r_0	Centre of gravity distance to the clamping jaw

The permissible speeds can be determined in accordance with VDI Guideline 3106 "Determining the permissible speed for lathe chucks (jaw chucks). This guideline also allows for the residual tensioning force at a specified speed to be determined.



4.14.3 Lathe chuck maintenance

A crucial prerequisite for fault-free functionality of a lathe chuck is regular and thorough lubrication of the sliding surfaces. This prevents the reduction of tensioning force and premature wear and tear.

Always observe the manufacturer's maintenance instructions when using replacement lathe chucks.

Coolant squirts on the lathe chuck and removes the grease from the jaws. In order to maintain the tensioning force and the long-term accuracy of the lathe chuck, the lathe chuck must be lubricated regularly. Insufficient lubrication will result in malfunctions with significantly reduced tensioning force, which affects the accuracy and causes excessive wear and seizing.

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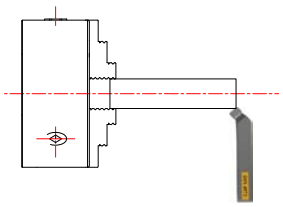
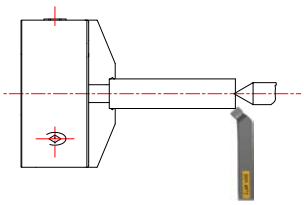
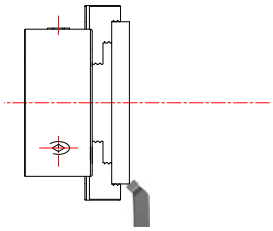
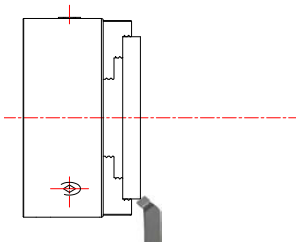
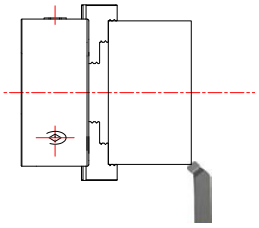
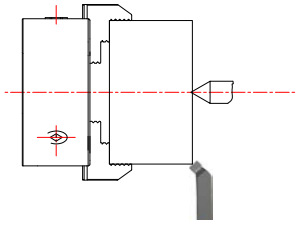
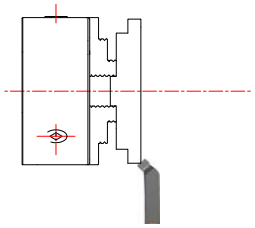
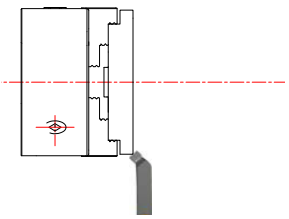
Lubricate the installed lathe chuck at least once per week. The used lubricant should be of high quality and provided for high pressure bearing surfaces. The lubricant should withstand the coolant and other chemicals.

Clamping jaws and jaw mounting screws are wear and tear parts. The service life is limited. We therefore recommend having them inspected at regular intervals by a specialist (e.g. inspection for cracks using a dye penetration process or magnet powder test (fluxing), eddy current testing, ultrasound testing) and replace if necessary.

4.15 Clamping a workpiece into the lathe chuck

When the workpiece is being clamped unprofessionally, there is a risk of injury as the workpiece may fly off or the jaws may break. The following examples do not show all possible situations of danger.

Incorrect		Correct	
	Clamping length too short, overhang too long.		Additional support over center or rest.
	Clamping diameter too large.		Larger lathe necessary.
	Workpiece is too heavy and clamping jaw is too short.		Support over center, enlarged jaw. Enlarged jaws are not available for this three-jaw chuck. Possibly use larger lathe.
	Clamping diameter too small.		Clamping on the largest possible diameter.

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4.15.1 Clamping long workpieces

o through the hollow shaft of the spindle

CAUTION!

Long rotating parts that protrude from the hollow shaft of the spindle must be secured by the operator using suitable covers. A cover can be a sleeve that is mounted on the headstock that, as a permanent safety device, completely covers the protruding workpiece.

o between the tips

CAUTION!

Long workpieces must be additionally supported. They are supported by the tailstock sleeve and, if necessary, a rest.

o with a lathe dog

CAUTION!

When clamping workpieces between the tips of the lathe while using a lathe dog, the existing lathe chuck protection must be replaced with a circular lathe chuck protection.

4.16 Mounting workpiece holder

DANGER!

Please observe the maximum permissible rotational speed of the supplied face plate and the four-jaw lathe chuck with individually clampable jaws.

4.16.1 Centering point in lathe spindle

→ Clean the taper bore of the lathe spindle holding fixture.
→ Clean the morse taper and the taper of the centring point.
→ Push the fixed MK3 centering point with reducing core MK6 / MK3 obtained in your delivery into the internal taper of the spindle holding fixture.

4.17 Mounting of rests

4.17.1 Follow rest and steady rest

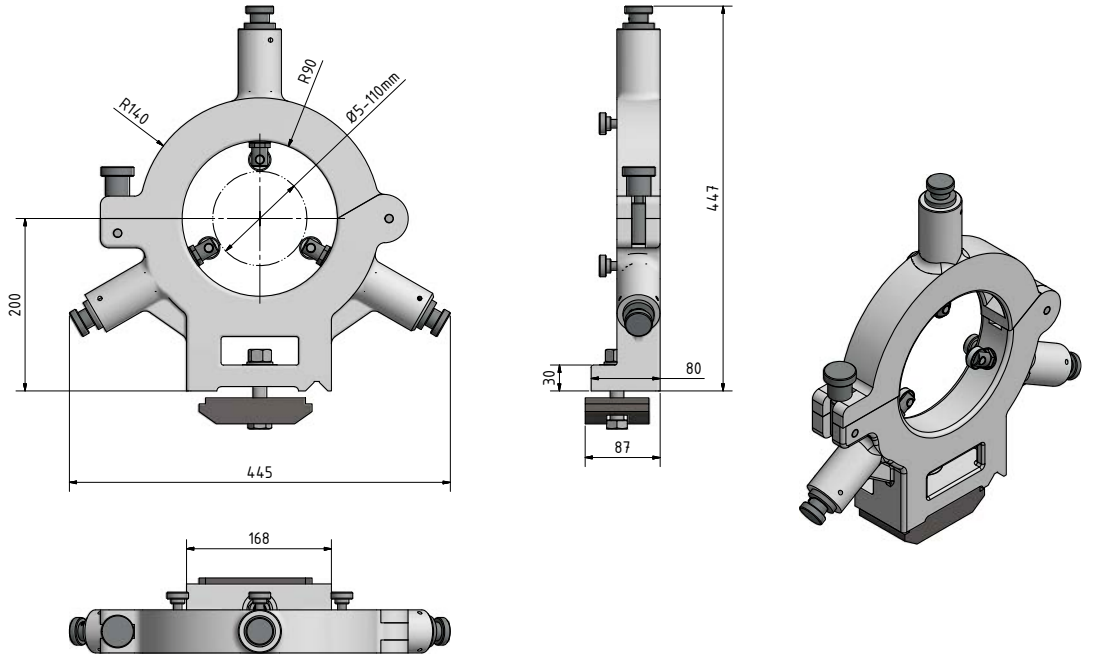
Use steady rest or follow rest to support longer parts and prevent the workpiece from flapping around and flying away.

CAUTION!

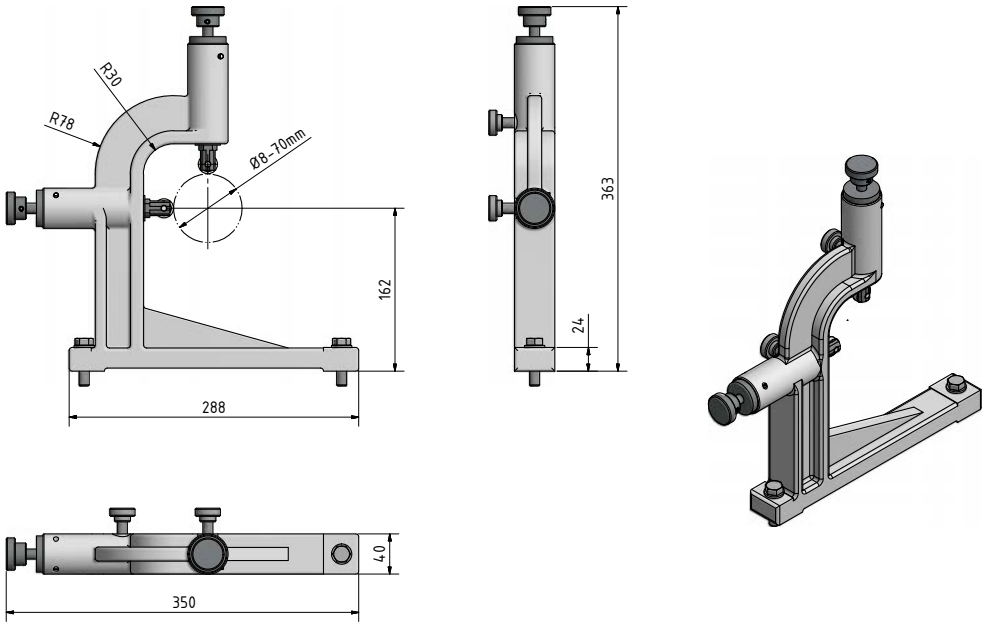
When mounting a rest, the rest is due his function near the top slide, which results in additional crushing and shearing points between the guide of rest and the workpiece.

Increased attention is therefore absolutely necessary when working with an rest.

Steady rest



Follow rest



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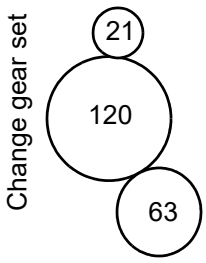
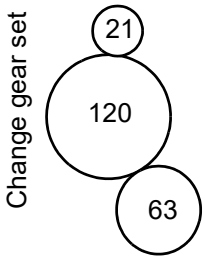
4.18 Feed tables

4.18.1 Longitudinal turning and face turning



Longitudinal feed table



Cross feed table

		mm/	E	F	G	H
A	C	K	0,0263	0,0329	0,0395	0,046
		L	0,0658	0,0822	0,0988	0,1151
		M	0,1315	0,1644	0,1976	0,2302
1/2	D	K	0,0526	0,0658	0,0789	0,0921
		L	0,1315	0,1644	0,1976	0,2302
		M	0,2631	0,3289	0,3946	0,4604
B	C	K	0,1052	0,1315	0,1558	0,1842
		L	0,2631	0,3289	0,3946	0,4604
		M	0,5262	0,6577	0,7892	0,9208
1	D	K	0,2105	0,2631	0,3116	0,3703
		L	0,5262	0,6577	0,7892	0,9208
		M	1,0523	1,3154	1,5785	1,8416

		mm/	E	F	G	H
A	C	K	0,0133	0,0166	0,02	0,0233
		L	0,0333	0,0416	0,05	0,0583
		M	0,0666	0,0832	0,0999	0,1165
1/2	D	K	0,0266	0,0333	0,0399	0,0466
		L	0,0666	0,0832	0,0499	0,1165
		M	0,1332	0,1645	0,1997	0,233
B	C	K	0,0533	0,0666	0,0799	0,0932
		L	0,1332	0,1665	0,1997	0,233
		M	0,2663	0,3329	0,3995	0,4661
1	D	K	0,1065	0,1332	0,1577	0,1864
		L	0,2663	0,3329	0,3995	0,4661
		M	0,5326	0,6659	0,7999	0,9321

Img.4-4: Feed table

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4.18.2 Setting the feed

WARNING!

Always set the selector switch (1) of the feed direction into the neutral centre position when the feed is not needed.

CAUTION!

The maximum permissible feed speed in the longitudinal direction is 500mm/min and 250mm/min in the face direction.

INFORMATION

The feed rate is only active when the selector switch (2) for selecting the speed is in position 1.

Turn the centre selector switch (3) completely clockwise to reach gear position H again.

Img.4-5: Feed gear selector switch

Example: Longitudinal feed 0.0263 mm / spindle revolution

→ Use the 21 | 120 | 63 change gears.
→ Set selector switch on feed gear to A | C | E | K.
→ Select feed direction.
→ Detach the clamping screw on lathe saddle at longitudinal feed.
→ Set engaging lever on apron to the position of the longitudinal feed. ► Feed on page 36

Example: Cross feed 0.0133 mm / spindle revolution

→ Use the 21 | 120 | 63 change gears.
→ Set selector switch on feed gear to A | C | E | K.
→ Set engaging lever on bed slide to the position of the cross feed.
→ Tighten the clamping screw on the bed slide.

4.19 Tables for thread cutting

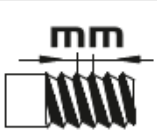
INFORMATION

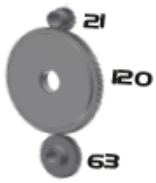
For producing threads in inch and D.P. and metric special threads, other change gears can be used. The default gear wheels 21 | 120 | 63 | 33 are already mounted in the machine for metric thread pitches and module threads. The gear wheel with 33 cogs is used as spacers for metric threads, the gear wheel with 21 cogs is used as spacers for module threads for the middle cog wheel with 120 cogs.

Additional change gears for producing inch or D.P. threads can be ordered with the following number of clogs in the complete package:

22 | 28 | 30 | 32 | 34 | 38 | 46 | 52 | 54 | 56 | 70 | 100 | 110 | 127

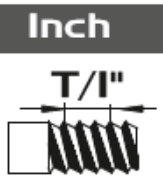
Metric

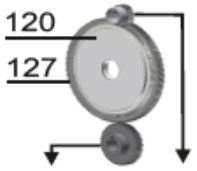




0,2	ACEK	1,75	ADHL
0,25	ACFK	2	ADEM
0,3	ACGK	2,5	ADFM
0,35	ACHK	3	ADGM
0,4	ADEK	3,5	ADHM
0,5	ADFK	4	BDEL
0,6	ADGK	5	BDFL
0,7	ADHK	6	BDGL
0,75	ACGL	7	BDHL
0,8	BCEK	8	BDEM
1	ADEL	10	BDFM
1,25	ADFL	12	BDGM
1,5	ADGL	14	BDHM

Inch





80	ACGK	63	21
72	ACFK	63	28
64	ACFK	56	28
56	ACGK	63	30
52	ACFK	52	32
48	ADFK	63	21
44	ACEK	33	30
40	ADGK	63	21
36	ADFK	63	28
32	ACGL	63	21
30	ADGK	63	28
27	ADFK	54	32
26	ADFK	52	32
24	ADEL	63	21
22	ADEK	33	30
20	BCGK	63	21
19	ACEL	38	32
18	ACGL	54	32
16	ADGL	63	21
14	BCGK	63	30
13	BCFK	52	32
12	BDFK	63	21
11 1/2	ADEL	46	32
11	BCEK	33	30
10	BDGK	63	21
9	ACGM	54	32
8	ADGM	63	21
7	BDGK	63	30
6	BDEL	63	21
5	BDEL	70	28
4 ½	BCGL	54	32
4	BDGL	63	21
3 ½	BDEL	56	32
3	BDEM	63	21
2 ¾	BCGL	33	32
2 ½	BDEM	70	28
2 ¼	BDGL	54	32
2	BDGM	63	21
1 ¾	BDFM	70	32
1 ½	BDGM	63	28
1 ¼	BDHM	70	32
1	BDHM	56	32

Img.4-6: Tables for thread cutting

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4.19.1 Adjusting threads

WARNING!

Set the selector switch (1) of the feed direction into the neutral centre position when no threads are cut.

INFORMATION

Turn the centre selector switch completely clockwise to reach gear position H again.

Img.4-7: Feed gear selector switch

Example: Thread pitch 3 mm (M 24)

→ Use the 21 | 120 | 63 change gears.
→ Set selector switch on feed gear to A | D | G | M.
→ Select feed direction.
→ Detach the clamping screw on lathe saddle at longitudinal feed.
→ Set engaging lever on bed slide to the position of turning threads. ► Feed on page 36

Example: Inch thread, 10 threads in a length of one inch

→ Use the 21 | 127 | 120 | 63 change gears.
→ Set selector switch on feed gear to B | D | G | K
→ Select feed direction.
→ Detach the clamping screw on lathe saddle at longitudinal feed.
→ Set engaging lever on bed slide to the position of turning threads.

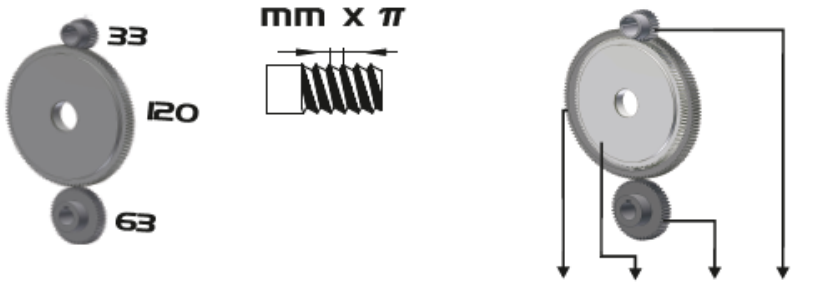
4.19.2 Module and diametrical threads

INFORMATION

The following tables are not mounted on the machine. The table is included separately when the machine is delivered.

In countries where the Anglo-American system of measurement is used, its inverse is used as a "diametrical pitch" (D.P.) with the unit 1 inch instead of the module.

$$\text{Module} = \frac{25.4}{\text{D.P.}}$$



0,1	ACEK
0,2	ADEK
0,25	ADFK
0,3	ADGK
0,35	ADHK
0,4	BCEK
0,5	ACEM
0,6	BCGK
0,7	BCHK
0,75	ADGL
0,8	BDEK
1	BCEL
1,25	BCFL
1,5	BCGL
1,75	BCHL
2	BDEL
2,5	BDFL
3	BDGL
3,5	BDHL
4	BDEM
5	BDFM
6	BDGM
7	BDHM

0,12	ACFK	100	110	70	32
0,14	ACGK	100	110	63	28
0,16	ACGK	100	110	63	32
0,18	ADEK	120	-	70	33
0,22	ADEK	100	110	63	33
0,28	ADGK	100	110	63	28
0,45	ADEL	120	-	70	33
0,56	ADEL	100	110	63	33
0,65	ACGL	100	110	63	52
0,85	ADGL	100	110	63	34
0,9	ADEM	120	-	70	33
0,95	ADEM	120	110	70	38
1,125	ADEM	120	-	56	33
1,375	BCFL	100	110	63	33
1,6	BDEL	120	110	70	32
2,25	BDEL	120	-	56	33
2,75	BDFL	100	110	63	33
3,15	BDHL	120	-	70	33
4,5	BDEM	120	-	56	33
5,5	BDFM	100	110	63	33
6,3	BDHM	120	-	70	33

Img.4-8: Module thread

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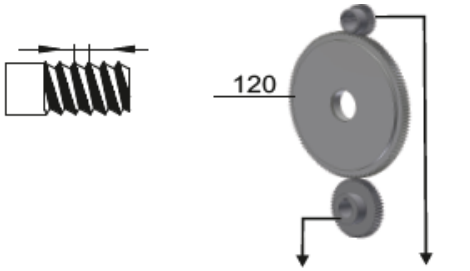
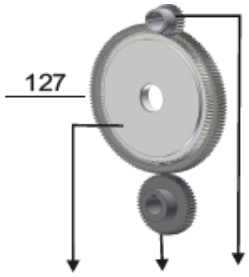
Metric



0,45	ADFK	70	21
4,5	BDFL	70	21
5,5	BCHL	63	33
9	BDFM	70	21
11	BDHL	63	33
16	BDGM	63	28
18	BDGM	56	28
20	BDHM	63	30
22	BDHM	63	33
24	BDHM	56	32

Inch



200	ADEK	120	70	22
180	ADEK	120	63	22
160	ADEK	120	56	22
140	ACGK	70	63	22
120	ADGK	120	63	22
100	BCEK	120	70	22
80	ADEL	120	70	22
72	ADEL	120	63	22
64	ADEL	120	56	22
56	ACEL	70	63	33
52	ADEK	63	52	33
48	ADEL	120	63	33
44	ADEL	120	56	32
40	ADEM	120	70	22
36	ADEM	120	63	22
32	ADEM	120	56	22
28	ADEL	70	63	33
24	ADEM	120	63	33
20	BDEL	120	70	22
18	BDEL	120	63	22
16	BDEL	120	56	22
14	ADEM	70	63	33
12	BDEL	120	63	33
11	BDEL	120	56	32
10	BDEM	120	70	22
9	BDEM	120	63	22
8	BDEM	120	56	22
7	BEDL	70	63	33
6	BDEM	120	63	33
5	BDEM	100	63	33
4	BDEM	120	28	22
3 1/2	BDEM	70	63	33
3	BDHM	70	63	22

Img. 4-9: D.P thread

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4.19.3 Calculating thread pitches

In order to produce thread pitches which are not indicated in the change gear tables, the change gear ratio must be re-determined.

It must be established if the newly determined change gear ratio can be plugged onto the change gear bar. We recommend to use change gear which can be delivered by us.

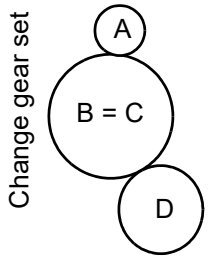
Usually, gear pairs can be used which are added at position A + B in the range of a cog number of 70 to 187. Added up at position C + D in the range of a cog number of 90 to 250. In any case, the sum of cogs C +D must be larger than B + 25. The total sum of cogs A + B + C + D must be in the range of 225 to 434.

If the required transmission cannot be achieved with the gears, gears of special forms must be produced or acquired. The gears we can provide are displayed in the change gear tables. There are renowned suppliers who can provide numbers of teeth in any module size. We cannot supply gears of special forms.

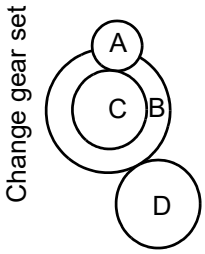
Determining a special thread pitch:

In a direct transmission from A to B = C and the back to D, the number of teeth on the middle gear (B = C) is insignificant.

Simple transmission for metric threads



Double transmission for inch threads



Img.4-10: Change gears

The gear transmission ratio [i] of a gear is the ratio of the driving toothed wheels to the driven toothed wheels.

Simple transmission:

$$i = \frac{A \times B=C}{B=C \times D} = \frac{A}{D}$$

Double transmission:

$$i = \frac{A \times B}{C \times D}$$

The number of teeth can be determined by sample calculations. The description for converting formulas and calculating several unknown tooth numbers by inserting, equating or adding cannot be described here, but is possible with the help of mathematical manuals.

As an option, you can use e. g. gear-conversion tables or a software which can calculate the number of teeth for a special pitch based on an algorithm. When a software is used, the deliverable gears in the used software should be deposited as a wheelset, otherwise you receive numbers of teeth for gears which then have to be produced or acquired.

If the required precision of a mechanical pitch cannot be achieved, the double transmission has to be used. In the transmission ration, select the corresponding multiplicator of the feed gear.

Transmission ratio of the feed gear with the lead screw:

Gear switch:	Ratio:	Gear switch:	Ratio:	Gear switch:	Ratio:
A | C | E | K	= 0.6	A | C | F | K	= 0.75	A | C | G | K	= 0.9
A | C | H | K	= 1.05	A | D | E | K	= 1.2	A | D | F | K	= 1.5
A | D | G | K	= 1.8	A | D | H | K	= 2.1	A | C | G | L	= 2.25
B | C | E | K	= 2.4	A | D | E | L	= 3	A | D | F | L	= 3.75
A | D | G | L	= 4.5	A | D | H | L	= 5.25	A | D | E | M	= 6
A | D | F | M	= 7.5	A | D | G | M	= 9	A | D | H | M	= 10.5
B | D | E | L	= 12	B | D | F | L	= 15	B | D | G | L	= 18
B | D | H | L	= 21	B | D | E | M	= 24	B | D | F | M	= 30
B | D | G | M	= 36	B | D | H | M	= 42		

Example: Thread pitch 1.25 mm per revolution

$$i = \frac{A}{D} \times [A \mid D \mid F \mid L] = \frac{21}{63} \times 3.75 = 1.25$$

INFORMATION

Gear range M can be used instead of L in combination with the double transmission of the change gear bars to increase the precision of the required special pitch.

For inch threads, the number of gears is used to determine the metric special pitches, as described in the example above. In principle, the double transmission on the change gear drive always has to be used.

With gear 127, 1 inch can always be displayed [127 / 5 = 25.4].

The gear combination 120 / 127 bridges the metric pitch of the lead screw from millimeter to inch. To determine inch special pitches, the gears 120 and 127 should be used in your calculations.

Img.4-11: Change gear bar, metric combination

4.20 Taper turning

4.20.1 Taper turning with the top slide

With the top slide, short cone up to 65° can be rotated. It is also possible to adjust the top slide over the 65°- angular mark.

→ Loosen the two nuts at the left and right of the top slide.

→ Swivel the top slide.

→ Clamp the top slide again.

4.20.2 Taper turning with the tailstock

The cross-adjustment of the tailstock is used for turning long, thin bodies.

→ Loosen the locking nut of the tailstock.

→ Unscrew the locking screw approximately half a turn.

By alternately loosening and tightening the two (front and rear) adjusting screws, the tailstock is moved out of the central position. The desired cross-adjustment can be read off the scale.

ATTENTION!

Check clamping of the tailstock and the sleeve, respectively for the turning jobs between the centres!

Tighten the securing screw at the end of the lathe bed in order to prevent the tailstock from unintentional drawing-out of the lathe bed.

4.20.3 Turning of cones with high precision

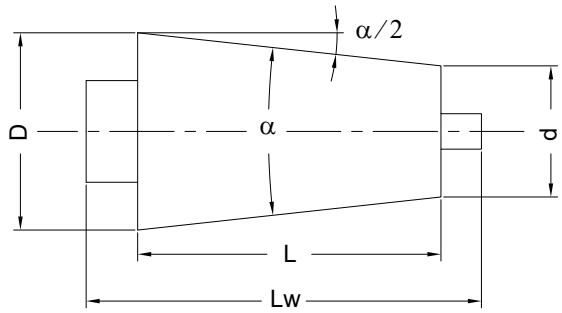


Abb.4-12: Designation on the cone

D = large diameter [mm]

d = small diameter [mm]

L = cone length [mm]

Lw = workpiece length [mm]

α = cone angle

$\alpha/2$ = setting angle

Kv = cone proportion

Vr = tailstock offset

Vd = measure change [mm]

Vo = twist measure of top slide [mm]

There are different possibilities to machine a cone on a common small lathe:

1. By twisting the top slide by setting the setting-angle with the angular scale. But there the graduation of the scale is too inaccurate. For chamfers and conic passings the graduation of the angular scale is sufficient.
2. By a simple calculation, a stop measure of 100mm length (of your own production) and a gauge with stand.

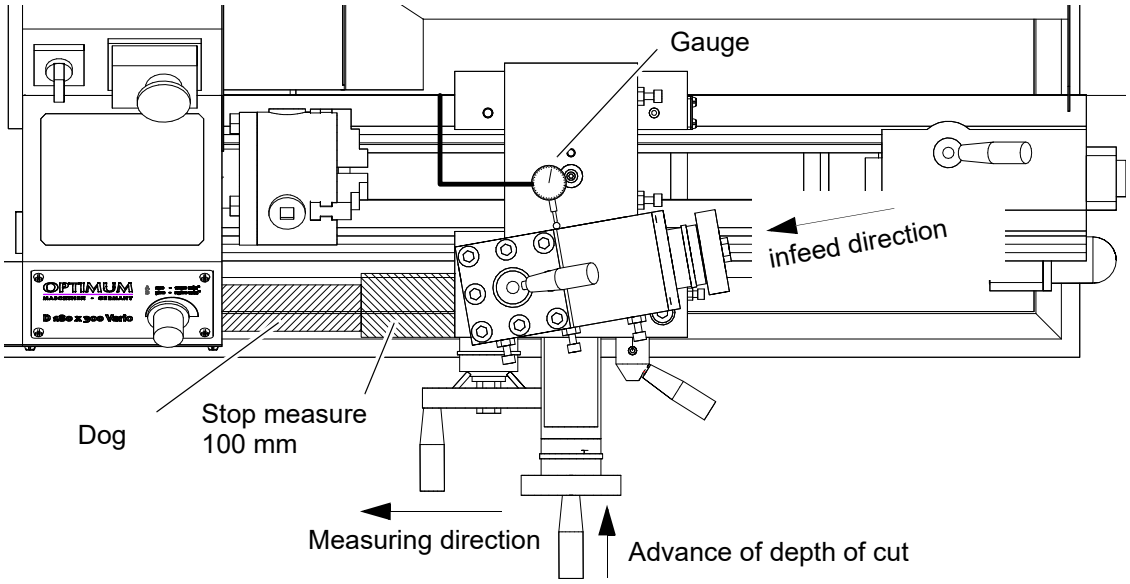
Calculation

of the offset of the top slide relating to the stop measure with a length of 100 mm.

Step by step		
$Kv = \frac{L}{D - d}$	$Vd = \frac{100mm}{Kv}$	$Vo = \frac{Vd}{2}$

by one calculation step (summary)
$Vo = \frac{100mm \times (D - d)}{2 \times L}$
Example: D = 30.0 mm ; d = 24.0 mm ; L = 22.0 mm
$Vo = \frac{100mm \times (30mm - 24mm)}{2 \times 22mm} = \frac{100mm \times 6mm}{44mm}$ 13.63mm

The stop measure (100mm) is to be put between a fixed unit stop and the bedslide. Put the gauge with stand on the lathe bed and horizontally align the test prod with the test prod with thetop slide (90° to the top slide). The twisting measure is calculated with the above mentioned formula.
The top slide is twisted by this value (then set the gauge to zero). After removing the stop measure, the bedslide will be aligned to the limit stop. The gauge must indicate the calculated value "Vo" Then the workpiece and the tool are clamped and positioned (the bedslide is fixed). The infeed is performed with the handwheel of the top slide. The depth of cut is advanced with the handwheel of the cross slide.



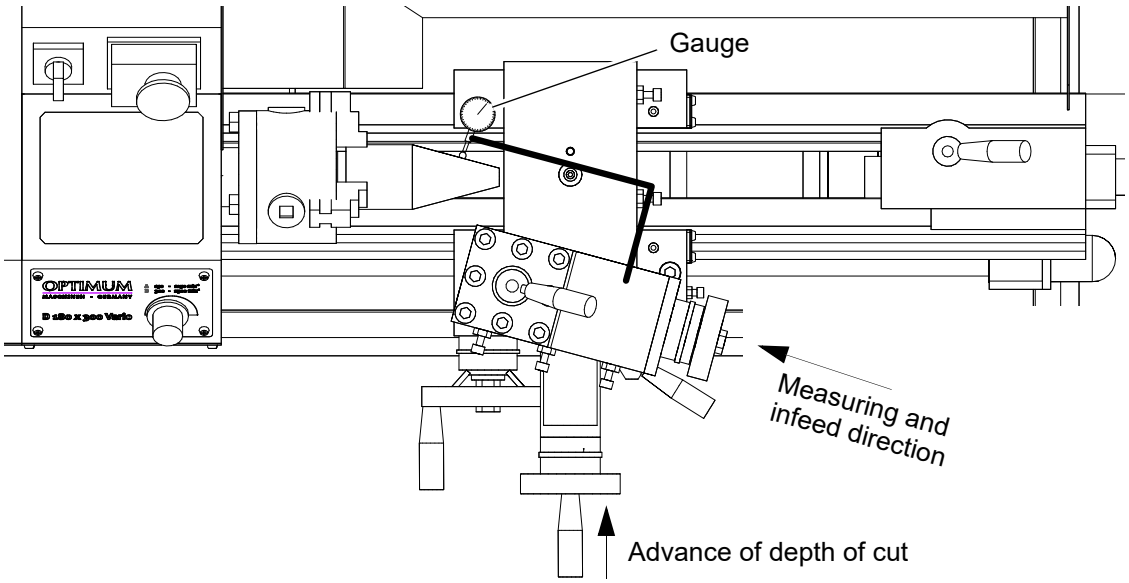
Img.4-13: Cone setting with stop measure

3. By measuring an existing cone with gauge and stand.

The stand is put on the top slide. The gauge is aligned horizontally and 90° to the top slide. The top slide is approximately adjusted to the cone angle and the test prod brought in contact with

the cone surface (fix the bedslide). Now the top slide is twisted in a way that the gauge does not indicate any travel of the pointer over the whole length of the cone (offset over the handwheel of the top slide).

Then you may start reaming the lathe as described under point 2. The workpiece might be a flange for lathe chucks or a face plate.



Img.4-14: Cone setting with stop measure

4. By offsetting the tailstock as the cone length is larger than the adjustable stroke of the top slide.

The workpiece is clamped between two points, therefore center holes are required on the face. They are to be drilled before removing the lathe chuck. The slaving of the workpiece is performed by a pulling pin and a lathe carrier.

The calculated value "Vr" is the offset measure of the tailstock. The offset is monitored with the gauge (also the return travel).

For this type of cone machining the lowest speed is used !

Annotation:

In order to check the position of the tailstock axis to the rotation axis, a shaft with two centeringsis clamped between the points. The stand with the gauge is put on the bedslide. The gauge is aligned 90° to the rotation axis and horizontally brought into contact with the shaft. The gauge will pass along the shaft with the bedslide. There must not be any travel of the pointer along the whole length of the shaft. If a deviation is being shown, the tailstock is to be corrected.

Calculation

Calculation:

$$Vr = \frac{Lw}{2 \times Kv} \quad \text{or} \quad Vr = \frac{D - d}{2 \times L} \times Lw$$

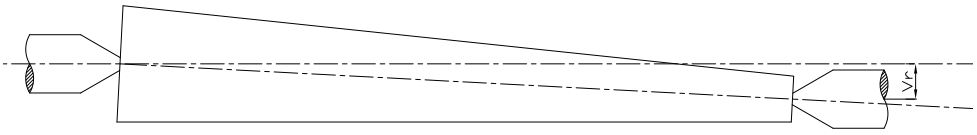
$$Vr_{max} = \frac{Lw}{50}$$

The tailstock offset must not exceed the value *"Vrmax"* as the workpiece tumbles!

Example:

Kv = 1 : 40 ; Lw = 150 mm ; L = 100 mm

$$Vr = \frac{150}{2 \times 40} = 1{,}875\text{mm} \qquad Vr_{max} = \frac{150}{50} = 3\text{mm}$$



Img.4-15: Workpiece between centres: Tailstock offset Vr

4.21 Tailstock quill

The tailstock quill is used to hold the tools (bits, centres, etc.)

The quill of the tailstock is useable with a drill chuck with countersinking tools.

→ Clamp the required tool into the quill of the tailstock.

→ Use the hand wheel to move the sleeve back and forth.

→ Clamp the sleeve with the clamping lever.

→ Use the adjustment and / or setting the [mm] - scale on the sleeve.

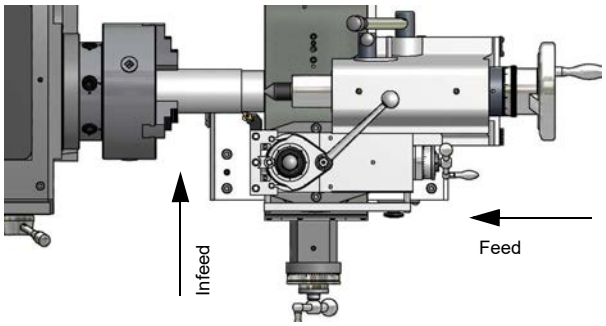
INFORMATION

When using different tools, it can happen that you cannot start with the quill marking with scale value 0, because the tool is already ejected in this position by the expulsion flap. In such cases we recommend to start at a value of 10mm and to convert from here on.

4.22 General operating instructions

4.22.1 Longitudinal turning

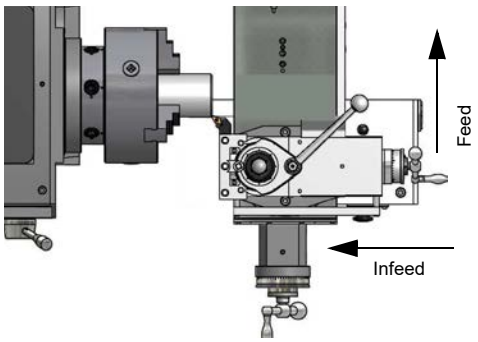
In the straight turning operation, the tool feeds parallel to the axis of rotation of the workpiece. The feed can be either manual - by turning the handwheel on the lathe saddle or the top slide - or by activating the automatic feed. The cross feed for the depth of cut is achieved using the cross slide.



Img.4-16: Graphic: Longitudinal turning

4.22.2 Face turning and recessing

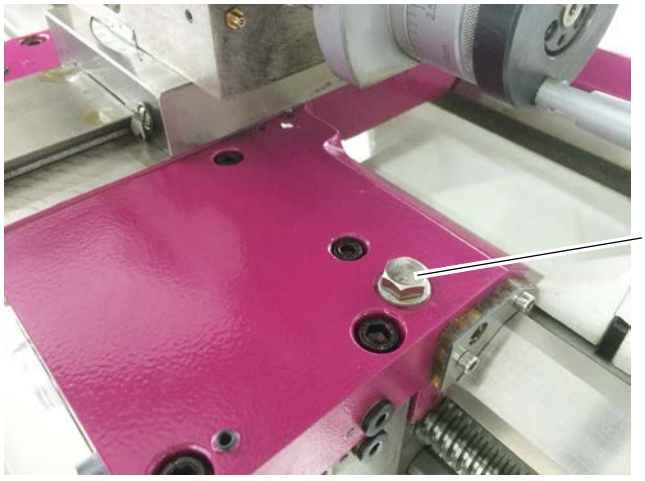
In the facing operation, the tool feeds perpendicular to the axis of rotation of the workpiece. Feed is done manually, using the cross-slide hand wheel. The infeed for cut depth is made with the top slide or lathe saddle.



Img.4-17: Graphic: Face turning

4.22.3 Fixing the lathe saddle

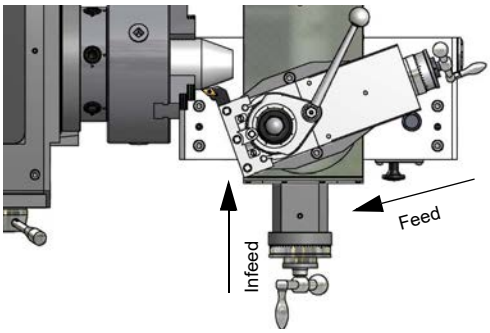
The cutting force produced during facing, recessing or slicing processes may displace the lathe saddle. Secure the lathe saddle using the tightening screw.



Img.4-18: Lathe saddle

4.22.4 Turning short tapers with the top slide

Short tapers are turned manually with the top slide. Swivel the top slide to the required angle. The infeed is achieved with the cross slide.



Img.4-19: Graphic: Turning tapers

→ Loosen the two clamping screws in the front and in the rear of the top slide.

→ Swivel the top slide.

→ Clamp the top slide again.

4.23 Standard values for cutting data when turning

The better the cutting data are selected, the better the turning result. Some standard values for cutting speeds of different materials are listed on the following pages. ► Cutting speeds on page 66

Criteria of the cutting conditions:

Cutting speed: Vc (m/min)

Depth of cut: ap (mm)

Infeed: f (mm/rev)

Cutting speed:

In order to get the speed for the machine settings of the selected cutting speeds the following formula is to be applied:

$$n = \frac{Vc \times 1000}{d \times 3.14}$$

Speed: n (1/min)

Workpiece diameter: d (mm)

Cutting depth:

In order to achieve a good chipping, the results of the depth of cut divided by the feed shall result in a figure between 4 and 10.

Example: ap = 1.0 mm; f = 0.14 mm/rev ; and this equals to in a value of 7.1 !

Feed:

The feed for rough turning is to be selected in a way that it does not exceed half the value of the corner radius.

Example: r = 0.4 mm ; equals to fmax. = 0.2 mm/rev !

For planing/turning the infeed should be maximum 1/3 of the corner radius.

Example: r = 0.4 mm ; equals to fmax. = 0.12 mm/rev !

4.24 Thread cutting

CAUTION!

The acceptable maximum feed speed for thread cutting is 0.5 meters per minute. Thread cutting is always done using the lowest speed adjustment.

The thread cutting process requires that the operator has a good knowledge of turning and sufficient experience.

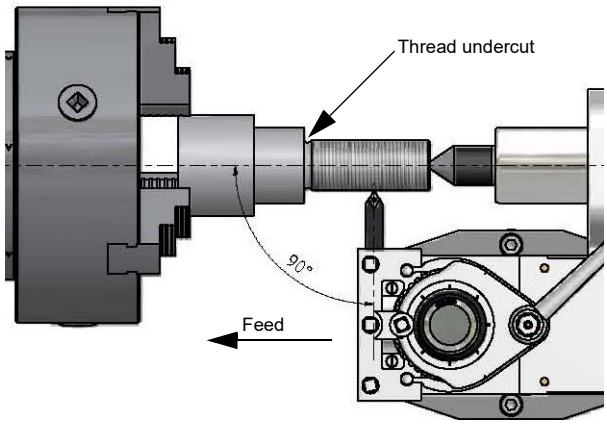
INFORMATION

The return run of the bed slide with a closed lead screw nut costs a lot of time when long and fine thread pitches are used. For thread pitches of 0.2 | 0.25 | 0.3| 0.4 | 0.5 | 0.6| 0.75 | 1 | 1.5 | 2| 3 | 6 mm, the lead screw nut can be opened and the bed slide can be moved back manually. After closing the lead screw nut of the lead screw, the thread cutting tool engages exactly in the previous thread.

NOTES!

Example of an external thread:

- The workpiece diameter must have been turned to the diameter of the desired thread.
- The workpiece requires a chamfer at the beginning of the thread and an undercut at the thread run out.
- The speed must be as low as possible.
- The thread cutting tool must be exactly the same shape as the thread, it must be absolutely rectangular and must be clamped in a way that it coincides exactly with the turning centre.
- The threading engaging lever must be engaged during the whole thread cutting process.
- The thread is produced in various cutting steps in a way that the cutting tool has to be turned out of the thread completely (with the cross slide) at the end of each cutting step.
- The tool is withdrawn with the lead screw nut engaged and the thread cutting tool disengaged by actuating the "Direction of rotation control lever".
- Stop the lathe and feed the thread cutting tool in low cut depths using the cross slide.



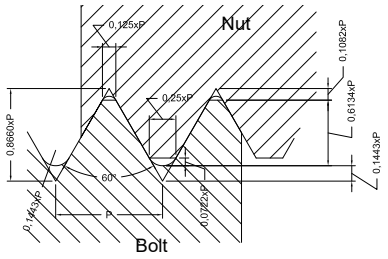
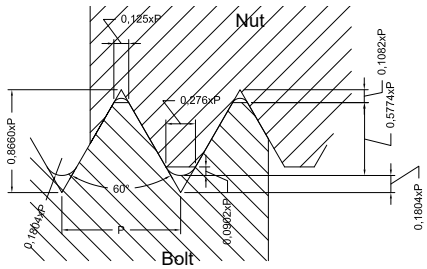
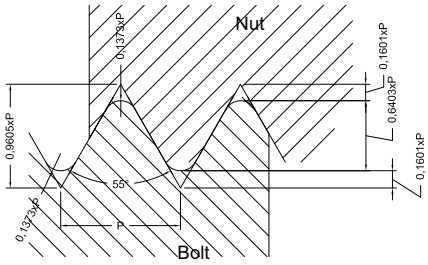
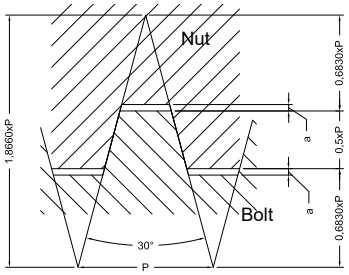
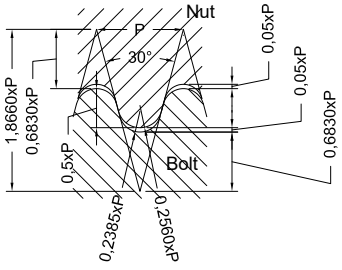
Img.4-20: Illustration: Thread cutting

- Before each passage, place the top slide approximately 0.2 to 0.3 mm to the left and right alternately in order to cut the thread free. In this way, the thread cutting tool cuts only on one thread flank with each passage. Do not execute any more free cutting, just before reaching the full thread depth.

4.24.1 Multiple-layered threads

A multi-layered thread is generated by shifting the hand wheel scale to the front. Use a digital position display or a gauge to achieve the thread distance.

4.24.2 Thread types

Designation	Profile	Code letter	Short term (e. g.)	Application
ISO-thread		M UN UNC UNF UNEF UNS	M4x12 1/4" - 20UNC - 2A 0.250 - UNC - 2A	Machine tools and general mechanical engineering
UNJ		UNJ	1/4" - 20UNJ	Aircraft and aerospace industry
Whitworth		B.S.W. W	1/4" in. -20 B.S.W.	Cylindrical threads, Pipe threads, or conical pipe threads for thread connections which seal
ISO-trapezoid thread (one- and multi-ple- threaded)		TR	Tr 40 x 7 Tr 40 x 14 P7	Motion thread, Leading spindle and transport spindle
Round thread		RD	RD DIN 405	Fittings and for purposes of the fire brigade

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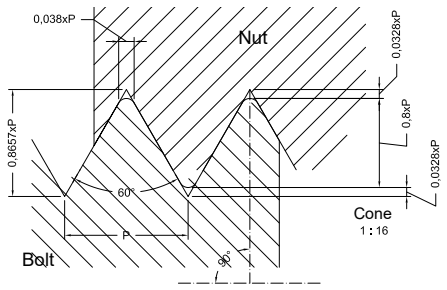
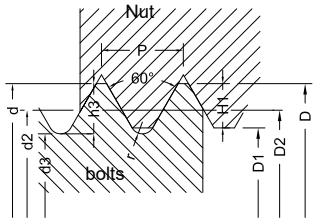
NPT		NPT	1“ – 11 ½“ NPT	Fittings and tube joints

4.24.3 Metric threads (60° flank angle)



pitch P

depth of thread of the bolt h2=0.6134 x P

depth of thread of the nut H1 = 0.5413 x P

rounding r = 0.1443 x P

flank diameter d2 = D2 =d - 0.6493

core removing hole drill = d - P

flank angle = 60°

Metric coarse-pitch thread

Sizes in mm: preferably use the threads in column 1

Thread denomination d = D		pitch P	Flank diameter d2 = D2	Core diameter		Depth of thread		Rounding r	Core removing hole drill
Column 1	Column 2			Bolt d3	Nut D1	Bolt h3	Nut H1		
M 1		0.25	0.838	0.693	0.729	0.153	0.135	0.036	0.75
	M 1.1	0.25	0.938	0.793	0.829	0.153	0.135	0.036	0.85
M 1.2		0.25	1.038	0.893	0.929	0.153	0.135	0.036	0.95
	M 1.4	0.3	1.205	1.032	1.075	0.184	0.162	0.043	1.1
M 1.6		0.35	1.373	1.171	1.221	0.215	0.189	0.051	1.3
	M 1.8	0.35	1.573	1.371	1.421	0.215	0.189	0.051	1.5
M 2		0.4	1.740	1.509	1.567	0.245	0.217	0.058	1.6
	M 2.2	0.45	1.908	1.648	1.713	0.276	0.244	0.065	1.8
M 2.5		0.45	2.208	1.948	2.013	0.276	0.244	0.065	2.1
M 3		0.5	2.675	2.387	2.459	0.307	0.271	0.072	2.5
	M 3.5	0.6	3.110	2.764	2.850	0.368	0.325	0.087	2.9
M 4		0.7	3.545	3.141	3.242	0.429	0.379	0.101	3.3
M 5		0.8	4.480	4.019	4.134	0.491	0.433	0.115	4.2
M 6		1	5.350	4.773	4.917	0.613	0.541	0.144	5.0
M 8		1.25	7.188	6.466	6.647	0.767	0.677	0.180	6.8
M 10		1.5	9.026	8.160	8.376	0.920	0.812	0.217	8.5
M 12		1.75	10.863	9.853	10.106	1.074	0.947	0.253	10.2

TZ4_GB_4.fm

	M14	2	12.701	11.546	11.835	1.227	1.083	0.289	12
M 16		2	14.701	13.546	13.835	1.227	1.083	0.289	14
	M18	2.5	16.376	14.933	15.294	1.534	1.353	0.361	15.5
M 20		2.5	18.376	16.933	17.294	1.534	1.353	0.361	17.5
	M 22	2.5	20.376	18.933	19.294	1.534	1.353	0.361	19.5
M 24		3	22.051	20.319	20.752	1.840	1.624	0.433	21
	M 27	3	25.051	23.319	23.752	1.840	1.624	0.433	24
M 30		3.5	27.727	25.706	26.211	2.147	1.894	0.505	26.5
M 36		4	33.402	31.093	31.670	2.454	2.165	0.577	32
M 42		4.5	39.077	36.479	37.129	2.760	2.436	0.650	37.5
M 48		5.5	44.752	41.866	41.866	3.067	2.706	0.722	43
M 56		5.5	52.428	49.252	49.252	3.374	2.977	0.794	50.5
M 64		6	60.103	56.639	56.639	3.681	3.248	0.866	58

Metric fine-pitch thread

Denomination of thread d x P	Flank diameter d2 = D2	Core diameter		Denomination of thread d x P	Flank diameter d2 = D2	Core diameter	
		Bolts	Nut			bolts	Nut
M2 x 0.2	1.870	1.755	1.783	M16 x 1.5	15.026	14.160	14.376
M2.5 x 0.25	2.338	2.193	2.229	M20 x 1	19.350	18.773	18.917
M3 x 0.35	2.773	2.571	2.621	M20 x 1.5	19.026	18.160	18.376
M4 x 0.5	3.675	3.387	3.459	M24 x 1.5	23.026	22.160	22.376
M5 x 0.5	4.675	4.387	4.459	M24 x 2	22.701	21.546	21.835
M6 x 0.75	5.513	5.080	5.188	M30 x 1.5	29.026	28.160	28.376
M8 x 0.75	7.513	7.080	7.188	M30 x 2	28.701	27.546	27.835
M8 x 1	7.350	6.773	6.917	M36 x 1.5	35.026	34.160	34.376
M10 x 0.75	9.513	9.080	9.188	M36 x 2	34.701	33.546	33.835
M10 x 1	9.350	8.773	8.917	M42 x 1.5	41.026	40.160	40.376
M12 x 1	11.350	10.773	10.917	M42 x 2	40.701	39.546	39.835
M12 x 1.25	11.188	10.466	10.647	M46 x 1.5	47.026	46.160	46.376
M16 x 1	15.350	14.773	14.917	M48 x 2	46.701	45.546	45.835

4.24.4 British thread (55° flank angle)

BSW (Ww.): British Standard Withworth Coarse Thread Series is the most common coarse thread in Great Britain and corresponds in its usage category to the metric coarse-pitch thread. The designation of a hexagon head screw 1/4" - 20 BSW x 3/4" , is here: . 1/4" is the nominal diameter of the screw and 20 is the number of threads in 1" of length

BSF: British Standard Fine Thread Series. British Standard Fine Thread Series. BSW- and BSF are the thread selection for the common screws. This fine thread is very common in the British machine tool industry, but it is replaced by the American UNF thread.

BSP (R): British Standard Pipe Thread. Cylindric pipe thread; designation in Germany: R 1/4" (nominal width of the tube in inch). Tube threads are larger in their diameter as "BSW". Designation 1/8" - 28 BSP

BSPT: BSPT: British Standard Pipe - Taper Thread. Conic tube thread, cone 1:16; designation: 1/4" - 19 BSPT

BA: BA: British Association Standard Thread (47 1/2° flank angle). Common with instruments and watches, is being replaced by the metric ISO thread and by the ISO miniature thread. It consists of numeric designations from 25 to 0=6.0 mm max diameter.

Table of the British threads

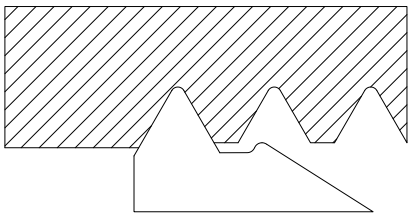
Nominal diameter of the thread		Threads in 1"				Threads in 1"		
		BSW	BSF:	BSP/BSPT		BA-threads		
Inch	mm			(R)	D. [mm]	No.		D. [mm]
		55° Flank angle				47 1/2° Flank angle		
1/16	1.588	60	-	-		16	134	0.79
3/32	2.382	48	-	-		15	121	0.9
1/8	3.175	40	-	28	9.73	14	110	1.0
5/32	3.970	32	-	-	-	13	102	1.2
3/16	4.763	24	32	-	-	12	90.9	1.3
7/32	5.556	24	28	-	-	11	87.9	1.5
1/4	6.350	20	26	19	13.16	10	72.6	1.7
9/32	7.142	20	26	-	-	9	65.1	1.9
5/16	7.938	18	22	-	-	8	59.1	2.2
3/8	9.525	16	20	19	16.66	7	52.9	2.5
7/16	11.113	14	18	-	-	6	47.9	2.8
1/2	12.700	12	16	14	20.96	5	43.0	3.2
9/16	14.288	12	16	-	-	4	38.5	3.6
5/8	15.875	11	14	14	22.91	3	34.8	4.1
11/16	17.463	11	14	-	-	2	31.4	4.7
3/4	19.051	10	12	14	26.44	1	28.2	5.3
13/16	20.638	10	12	-	-	0	25.3	6.0

7/8	22.226	9	11	14	30.20
15/16	23.813	9	11	-	-
1"	25.401	8	10	11	33.25
1 1/8	28.576	7	9	-	-
1 1/4	31.751	7	9	11	41.91
1 3/8	34.926	6	8	-	-
1 1/2	38.101	6	8	11	47.80
1 5/8	41.277	5	8	-	-
1 3/4	44.452	5	7	11	53.75
1 7/8	47.627	4 1/2	7	-	-
2"	50.802	4 1/2	7	11	59.62

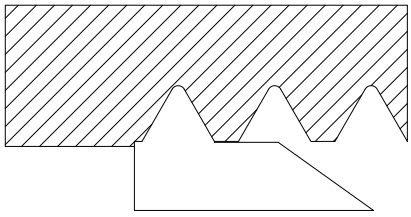
4.24.5 Indexable inserts

For indexable inserts there are partial profile and full profile indexable inserts. The partial profile indexable inserts are designed for a certain pitch range (e.g. 0.5 - 3 mm).

- The partial profile indexable insert is optimally appropriate for the single-piece production.
- The full profile indexable insert is only designed for a certain pitch.



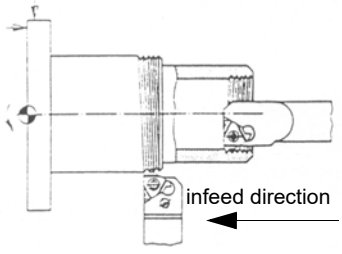
Img.4-21: partial profile indexable insert



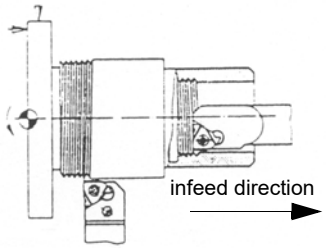
Img.4-22: full profile indexable insert

Determining the machining method of right-handed and left-handed threads:

Right-handed tool holders or drill rods are used. In order to top right-handed threads the feed direction towards the clamping chuck is selected and the machine spindle turns to the right (the turning direction of the machine spindle is determined when you look into the spindle from the rear side). If a left-handed thread is to be tapped, the feed direction is selected away from the clamping chuck in direction to the tailstock and the machine spindle turns to the right.

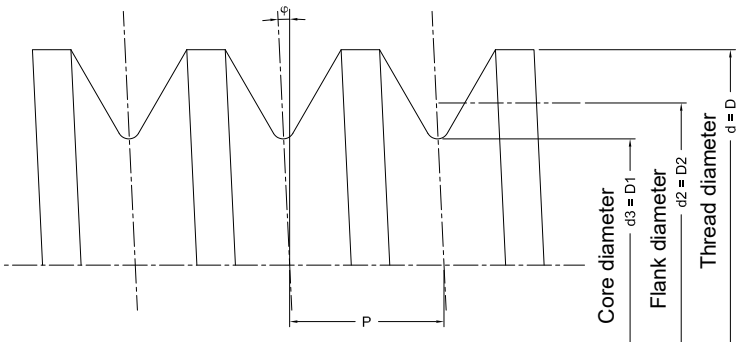


Img.4-23: right-handed thread with the machine spindle turning to the right



Img.4-24: left-handed thread with the machine spindle turning to the right

As for thread cutting there are other conditions as for longitudinal turning, the forward cutter must show a larger clearance as the pitch angle of the thread.



Pitch angle φ

Pitch P

$$\tan\varphi = \frac{P}{D_2 \times \pi}$$

Img.4-25: Pitch angle

4.25 Cooling lubricant

WARNING!

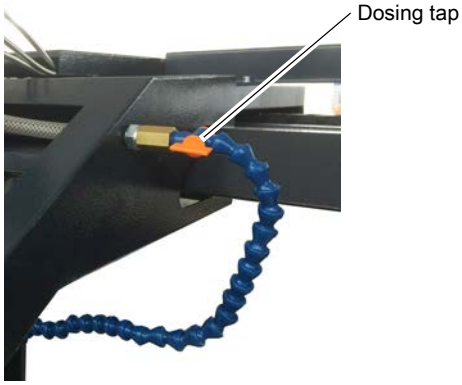
Ejection and overflowing of coolants and lubricants. Make sure you do not get the cooling lubricants on the floor. Spilled on the floor cooling agents must be removed immediately.

Regularly clean the coolant collector and the coolant tank.

Friction during the cutting process causes high temperatures at the cutting edge of the tool. The tool should be cooled during the milling process. Cooling the tool with a suitable cooling lubricant ensures better working results and a longer service life of the cutting tool.

→ Turn on coolant on the control panel in chip guard.

→ Open the dosing tap and set the coolant amount accordingly.



Img.4-26: Coolant tap on chip guard

INFORMATION

The lathe is lacquered with a one-component paint. Consider this fact when selecting your cooling lubricant.

The company Optimum Maschinen Germany GmbH does not assume any guarantee for subsequent damages due to unsuitable cooling lubricants.

The flashpoint of the emulsion must be higher than 140°C.

When using non-water-miscible cooling lubricants (oil content > 15%) with a flashpoint, ignitable aerosol air mixtures might develop. There is a potential danger of explosion.

The selection of cooling lubricants and slideway oils, lubricating oils or greases as well as their care are being determined by the machine operator or operating company.

Therefore, Optimum Maschinen Germany GmbH cannot be held liable for machine damages caused by unsuitable coolants and lubricants as well as by inadequate maintenance and servicing of the coolant. In case of problems with the cooling lubricant and the slideway oil or grease, please contact your mineral oil supplier.

CAUTION!

The cooling lubricant needs to be checked at least weekly, including during downtimes, with regard to its concentration, ph-value, bacteria and fungal decay.

► **Cooling lubricants and tanks on page 79**

► **„6.6.1 Inspection plan for water-mixed cooling lubricants“ on page 80**

Please note the VKIS - VSI - IGM substance list for coolant lubricants as per DIN 51385 for metal working.

We would like to ask you to have the following machine-related properties of the cooling lubricant confirmed in writing by the manufacturer of the cooling lubricant.

- The products must comply with the provisions of the current statutory regulations and the employers' liability insurance association.
- Request documentation for the products such as the product description VKIS and EC safety data sheet from the cooling lubricants manufacturer. The EC safety data sheet gives you information about the water hazard class.

They need to be environmentally friendly and workplace-friendly. Thus, they need to be free of nitrite, PCB, chlorine and nitrosatable diethanolamine (DEA), according to TRGS 611.

- The manufacturer should be able to provide a certificate concerning skin tolerance.
- The mineral oil content according to DIN 51417 should be at least 40% in the concentrate.
- If possible, it should be universally applicable for all chippings and materials.
- Long service life of the emulsion e.g. long-term stable and resistant to bacteria.
- Safe corrosion protection according to DIN 51360/2.
- Re-emulsifiable and non-adhesive according to VKIS sheet 9: Sticking and residue behaviour.
- It should not attack the varnish of the machine according to VDI 3035.
- It should not attack any machine elements (metals, elastomers).
- Low foaming behaviour of the emulsion.
- It should be as finely dispersed as possible in order to avoid clogging in the needle slot screen.

5 Cutting speeds

5.1 Selecting the cutting speed

The variety of factors makes it impossible to present universal indications about the "correct“ cutting speed.

Tables with reference values about cutting speeds to be set must be evaluated with utmost caution since they only apply for very particular cases. The reference values without cooling (no best values) which are indicated in AWF documents are highly recommended. Furthermore, the tables of reference values of the manufacturers of cutting materials should be evaluated e.g. for hard metal cutting materials the indications of the company Friedrich Krupp Widia-Fabrik, Essen applies.

V_{c60} is the cutting speed at 60 min. service life, V_{c240} according for 240 min. service life. Select V_{c60} for simple, easily replaceable lathe tools; V_{c240} for simple tool sets depending on one another; V_{c480} for complicated tool sets where the tool change requires more time due to the dependencies on one another and the accuracies of the cutting insert. The same considerations apply with regard to maintenance of the tools. It generally applies: High cutting speeds result in low-time chipping, little cutting speeds result in cost-efficient chipping.

5.2 Influences on the cutting speed

$\mathbf{v_c}$ = Cutting speed in [m/min]

t = Service life in [min]

The service life **t** is the period of time in minutes during which the cutting insert performs cutting tasks until it is necessary to re-sharpen it. It is of utmost commercial importance. For the same material **t** is smaller the higher you select the value $\mathbf{v_c}$ e.g. only a few minutes at $\mathbf{v_c}$ = 2000 m/min. Different materials require different $\mathbf{v_c}$ for the same **t** . All considerations of this type require that the other cutting conditions are maintained constant (material, tool and setting conditions). If only one of these condition changes it is also necessary to change $\mathbf{v_c}$ in order to obtain the same **t** . Therefore, only cutting speed tables are reasonable which show all relevant cutting conditions.

5.3 Example for the determination of the required speed on your lathe

The necessary speed is depending on the diameter of the workpiece, of the material to be machined, of the turning tool, as well as of the setting of the turning tool (cutting material) to the workpiece.

Material to be turned: St37

Cutting material (turning tool): Hard metal

Setting angle [k_r] of the turning tool to the workpiece: 90°

selected infeed [f]: about 0.16mm/rev

the cutting speed [V_c] according to the table: 180 meters per minute

diameter [d] of your workpiece: 60mm = 0.06m [meters]

Speed $n = \frac{Vc}{\pi \times d} = \frac{180m}{min \times 3.14 \times 0.06m} = 955$ rpm

Set the speed on your lathe below the calculated speed.

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5.4 Cutting speeds table

Reference values for cutting speeds $\mathbf{v_c}$ in **m/min** when turning high speed steel and hard metal. (Excerpt from VDF 8799, Gebr. Boehringer GmbH, Göppingen)

Material	Tensile strength R_m in N/mm²	Cutting material [3]	Infeed *f* in mm/rev. and setting angle k_r [1] [2]																										
			0.063			0.1			0.16			0.25			0.4			0.63			1			1.6			2.5		
			45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°	45°	60°	90°
St 34; St 37; C22; St 42	up to 500	High-speed steel							50	40	34.5	45	35.5	28	35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10
		P 10	250	236	224	224	212	200	200	190	180	180	170	160	162	150	140	140	132	125	125	118	112	112	106	100			
St 50; C 35	500...600	High-speed steel							45	35.5	28	35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8
		P 10	224	212	200	200			180	170	160	160	150	140	140	132	125	125	118	112	112	106	100	100	95	90			
St 60; C45	600...700	High-speed steel							35.5	28	22.4	28	22.4	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3
		P 10	212	200	190	190	180	170	170	160	150	150	140	132	132	125	118	118	112	106	106	100	95						
St 70; C60	700...850	High-speed steel							28	22.4	18	25	20	16	12.5	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3	8	6.3	5
		P 10	180	170	160	160	150	140	140	132	125	125	118	112	106	100	95	95	90	85	85	80	75						
Mn-; CrNi-, CrMo- among others alloyed steels	700...850	High-speed steel							25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	11	9	7	9	7	5.6	7.5	6	4.5
		P 10	180	170	160	160	150	140	140	132	125	125	118	112	106	100	95	95	90	85	85	80	75						
	850...1000	High-speed steel							20	16	12.5	16	12.5	10	12.5	10	8	10	8	6.3	8	6.3	5	7.1	5.6	4.5	5.6	4.5	3.6
		P 10	140	132	125	125	118	112	100	95	90	90	85	80	71	67	63	63	60	56	56	53	50						
	1000..1400	High-speed steel							14	11	9	11	9	7	9	7	5.6	7	5.6	4.5	5.6	4.5	3.6	4.5	3.6	2.8	3.6	2.8	2.2
		P 10	80	75	71	71	67	63	63	60	56	56	53	50	50	47.5	45	45	42.5	40	33.5	33.5	31.5						
Rust-resistant steel	600..700	P 10	80	75	71	71	67	63	56	53	50	50	47.5	45	45	42.5	40	33.5	33.5	31.5	31.5	30	28						
Tool steel	1500..1800	High-speed steel							9	7	5.6	5.6	4.5	3.6	4	3.2	2.5												
		P 10	45	42.5	40	40	37.5	35.5	35.5	33.5	31.5	28	26.5	25	25	23.4	22	22	21	20	18	17	16						
Mn - High-carbon steel		P 10	33.5	33.5	31.5	31.5	30	28	28	26.5	25	22	21	20	20	19	18	18	17	16									
GS-45	300..500	High-speed steel							45	35.5	28	35.5	28	22	31.5	25	20	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8
		P 10	150	140	132	118	112	106	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60						
GS-52	500..700	High-speed steel							28	22	18	25	20	16	20	16	12.5	16	12.5	10	12.5	10	8	11	9	7	9	7	5.6
		P 10	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5						
GS-15	HB...2000	High-speed steel							45	40	31.5	31.5	28	22	22	20	16	18	16	12.5	12.5	11	9	11	10	8	9	8	6.3
		K20	125	118	112	112	106	106	100	95	95	90	85	85	80	75	75	71	67	67	63	60							
GS-25	HB 2000..2500	High-speed steel							28	25	20	20	18	14	14	12.5	10	11	10	8	9	8	6.3	7.5	6.7	5.3	6	5.3	4.25
		K10	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5	47.5	45	42.5	42.5	40	37.5			
GTS-35 GTW-40		High-speed steel							37.5	33.5	33.5	28	26.5	25	22	21	20	18	17	16	12.5	12	11	11	10	10	9	8.5	8
		K10/P10	95	90	85	85	80	75	75	71	67	67	63	60	60	56	53	53	50	47.5	47.5	45	42.5	42.5	40	37.5			
White cast iron	RC420..570	K10	19	18	17	17	16	15	15	14	13.2	13.2	12.5	11.8	11.8	11.2	10.6	10.6	10	9.5	9	8.5	8	8	7.5	7.1			
Cast bronze DIN 1705		High-speed steel							53	50	47.5	47.5	45	42.5	42.5	40	37.5	37.5	35.5	33.5	31.5	30	28	28	26.5	25	25	23.6	22.4
		K 20	315	300	280	280	265	250	250	236	224	224	212	200	200	190	180	180	170	160	160	150	140	140	132	125			
Red brass DIN 1705		High-speed steel							75	71	67	63	60	56	50	47.5	45	40	37.5	35.5	31.5	30	28	28	26.5	25	25	23.6	22.4
		K 20	425	400	375	400	375	355	355	335	315	335	315	300	300	280	265	265	250	236	250	236	224	236	224	212			
Brass DIN 1709	HB 800..1200	High-speed steel							112	106	100	90	85	80	67	63	60	50	47.5	45	37.5	33.5	33.5	26.5	25	23.6			
		K 20	500	475	450	475	450	425	450	425	400	400	375	355	355	335	315	335	315	300	300	280	265	280	265	250			
AL cast DIN 1725	300..420	High-speed steel	125	118	112	100	95	85	75	71	67	56	53	50	42.5	40	37.5	31.5	30	28	25	23.6	22.4						
		K 20	250	236	224	224	212	200	200	190	180	180	170	160	160	150	140	140	132	125	125	118	112	118	112	106	100	95	90
Mg alloy DIN 1729		High-speed steel	850	800	750	800	750	710	750	710	670	670	630	600	630	600	560	600	560	530	600	560	530	560	530	500	530	500	475
		K 20	1600	1500	1400	1320	1250	1250	1180	1120	1120	1120	1060	1000	1000	950	900	900	850	800	800	750	710	710	670	630	630	600	560

1) The entered values apply for a chipping depth of up to 2.24 mm. From 2.24 mm to 7.1 mm the values must be reduced by 1 stage of the row R10 by approximately 20%. From 7.1 mm to 22.4 mm the values must be reduced by 1 stage of the row R5 by approximately 40%.

2) The values $\mathbf{v_c}$ must be reduced by 30 .... to 50% for turning a crust, for removal of cast skin or for sand inclusions.

3) The service life **t** for hard metal P10, K10, K20 = 240 min; for high speed steel SS = 60 min.

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6 Maintenance

In this chapter you will find important information about

- Inspection
- Maintenance
- Repair

of the lathe.

ATTENTION!

Properly performed regular maintenance is an essential prerequisite for

- **operational safety,**
- **failure-free operation,**
- **long durability of the lathe and**
- **the quality of the products which you manufacture.**

Installations and equipment from other manufacturers must also be in good order and condition.

Attention!

Never remove chips or clean the working area of the lathe with compressed air. Cleaning inside the working area using compressed air may cause damages to the lathe.

6.1 Safety

WARNING!

The consequences of incorrect maintenance and repair work may include:

- **Severe injuries of persons working on the lathe,**
- **Damage to the lathe.**

Only qualified personnel should carry out maintenance and repair work on the lathe.

Validation

Check and maintain all safety-relevant stop, control and measuring devices (validation).

Documentation

Record all tests and works in a operator's log resp. log book.

6.1.1 Preparation

WARNING!

Only carry out work on the lathe, if the main switch is switched off and secured against restarting by means of a padlock.

► Disconnecting and securing the lathe on page 17

Attach a warning sign.

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6.1.2 Restarting

Before restarting, run a safety check.

► Safety check on page 15

WARNING!

Before starting the lathe, you must check that there is no danger for persons and that the lathe is not damaged.

6.2 Inspection and maintenance

The type and level of wear depends to a large extent on the individual usage and operating conditions. Any indicated intervals therefore are only valid for the corresponding approved conditions.

Interval	Where?	What?	How?	Check ✔
Start of work, after each maintenance or repair work	Lathe	► Safety check on page 15		
	Spindle holding fixture	Fixing, check	Check screw connection of workpiece carrier	
Start of work, daily	Chip sump and inner space	Cleaning	→ Clean the interior of the lathe and the chip sump. Use a tenterhook to pull out long cips.	
	Apron	Check oil quantity	→ Check the oil level in the apron. Check the oil level using the inspection window. Level max. until the middle of the inspection window. The manual hand pump for central lubrication system is supplied with the oil from the apron.	
	Coolant tray	Cleaning	► Cleaning the coolant tray on page 75	

Interval	Where?	What?	How?	Check ✔
Weekly	Sight window	Cleaning	→ Clean the window with a suitable cleaning agent.	
		Oiling	→ Oil all bare steel surfaces.	
	Cooling lubricant tank	Status control Fill level control	→ Check for liquid level, concentration, pH value, bacteria and fungal decay. ► Inspection plan for water-mixed cooling lubricants on page 80	
	Lathe	Oiling	→ Oil all guide rails. → Slightly lubricate the change gears with lithium-based grease.	
	Gear	Fill level control	→ Check the oil level in the feed gear and headstock. Check the oil level using the inspection window. Level max. until the middle of the inspection window.	
For the first time after some operating hours, according to demand.	V-belt Spindle drive	Check Readjust	The machine was delivered with preloaded V-belt. → After a few hours operation, the belts must be tightened again as they stretch due to being new. ► Tighten the V-belt on page 74	
Weekly	Lead screw Feed rod Tailstock, lathe saddle, Cross slide	Oiling	→ Lubricate respectively fill-in all lubricating nipples and oiler cups with machinery oil.	
at least weekly	Lathe chuck	Lubricating	► Lubricating and cleaning the lathe chuck on page 77	

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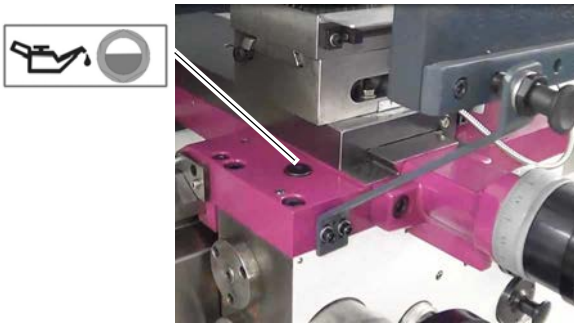
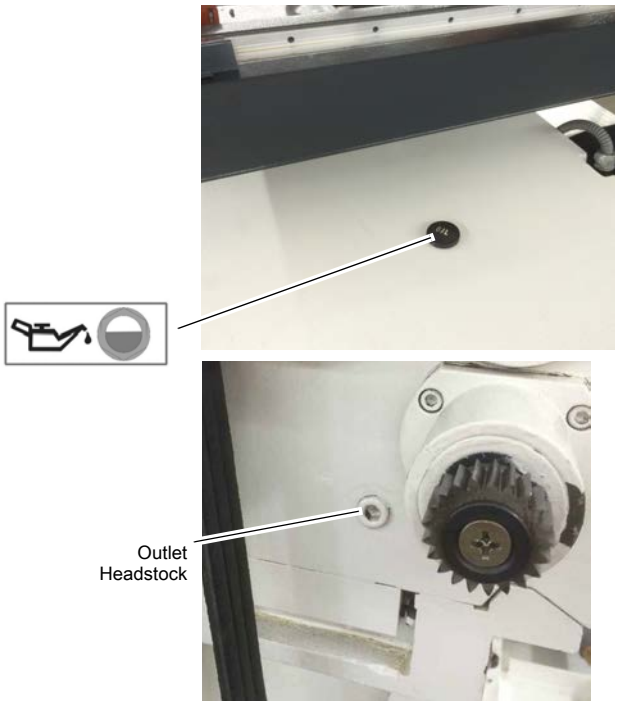
Interval	Where?	What?	How?	Check ✔
First after 150 operating hours, then all 2000	Feed gear	Oil change	→ For oil change use an appropriate collecting container with sufficient capacity. → Unscrew the screw from the drain hole. → Unscrew the screw from the filler hole. → Close the drain hole if no more oil drains. → Fill up to the middle of the reference mark of the oil sight glass into the filler hole using a suitable container. ► Operating material on page 22 Img.6-1: Feed gear	
First after 150 operating hours, then all 2000	Apron	Oil change	 Img.6-2: Apron	

Interval	Where?	What?	How?	Check ✔
First after 150 operating hours, then all 2000	Headstock	Oil change	→ Swing the change gear bar down in order to reach the drain hole better.  Img.6-3: Headstock	
Every 1000 operating hours	Electrical cabinet	Cleaning	► Cleaning the electrical cabinet on page 77	
at least annually	Cooling lubricant system	Replacing Cleaning Disinfect	► Inspection plan for water-mixed cooling lubricants on page 80	

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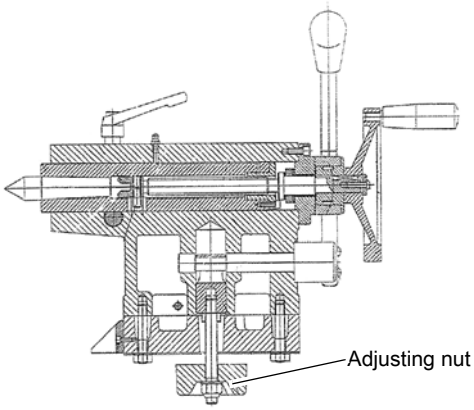
Interval	Where?	What?	How?	Check ✔
When necessary	Tailstock	tighten	→ If the tailstock clamping wears off. Shorten the clamping distance by adjusting the nut below the tailstock.  	
based on operator's empirical values	Electronics	Electrical inspection	► Obligations of the operating company on page 11 ► Electronics on page 18 ► Validation on page 68	
after 5 years			Exchange of the window ► Chip guard shield on page 15	
after 3 years	Electronics	Replacing	The service life off the position switch on the rotational direction lever for counter clockwise rotation may have been reached due to the operating conditions. Replacement is recommended to ensure further, fault-free operation. By the service technicians ► Customer service technician on page 78	
after 6 years	Electronics	Replacing	The service life off the position switch on the lathe chuck protection may have been reached due to the operating conditions. Replacement is recommended to ensure further, fault-free operation. By the service technicians ► Customer service technician on page 78	
after 6 years	Electronics	Replacing	The service life off the clock timer for the DC brake may have been reached due to the operating conditions. Replacement is recommended to ensure further, fault-free operation. By the service technicians ► Customer service technician on page 78	

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6.3 Recommended wear and tears parts

V-belt set (3 pcs.) of drive
Window in chips shield
1 pcs. Position switch of rotational direction lever
1 pcs. Lathe chuck position switch
1 pcs. Clock timer DC brake
Stripper on the guide tracks
Shear pin in driveshaft for lead screw

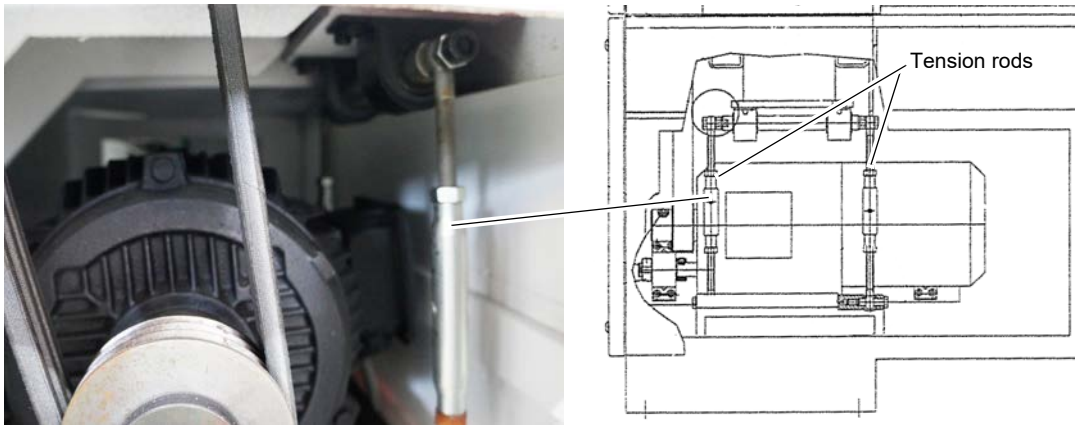
6.4 Maintenance

6.4.1 Tighten the V-belt

The machine was delivered with preloaded V-belt. After a few hours operation, the V-belt package must be tightened again as they stretch due to being new.

The correct tension of the V-belts is subject to the experience of the maintenance staff. As a guide, we recommend to stretch the V-belts, that they can push through about 25mm in the middle between the belt pulleys with a force of 50N. The tension is correct if, upon start-up, the belts do not slide or make noise.

The accessibility is easier when the cover is disassembled from the front.



Img. 6-4: Side view Front view

6.4.2 Refilling the cooling lubricant

If the cooling lubricant level is below the red mark on the sight glass, an insufficient amount of cooling lubricant is supplied to the cutting tool. Continuing production under such conditions results in reduced durability of the cutting tool and reduces the service life of the coolant pump.

Fill the coolant tank through the working area of the lathe.

The machine is lacquered with a one-component paint. Observe this fact when selecting your cooling lubricant and cleaning of the machine.

A one-component lacquer with solvent part hardens when the solvent evaporates.

As soon as the lacquer is applied the solvent evaporates into the air. The binder becomes felted and a dry film is formed. This process is reversible, i.e. the binder can be etched again and again.

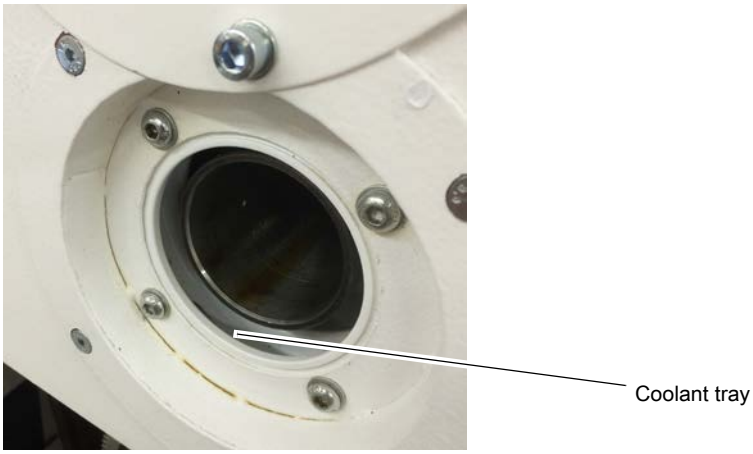
Two-component lacquer also consists of binder and solvent. However, the lacquer dries only in connection with an added hardener. This process is not reversible, i.e. the binder cannot be etched again and again.

The company Optimum Maschinen Germany GmbH does not assume any guarantee for subsequent damages due to unsuitable cooling lubricants.

6.4.3 Cleaning the coolant tray

Coolant and chips get into the coolant tray at the rear via the spindle hole. The coolant is again conveyed into the coolant tank via the discharge hose. If too many chips are accumulated at the rear, the coolant is not correctly discharged and runs directly onto the floor.

Therefore, remove daily the accumulated chips from the coolant collector and check the drain hose regularly for clogging.



Img. 6-5: Coolant collector - rear bar passage

6.4.4 Replacement of the shear pin on the lead screw

A shear pin protects the feed gear at the output shaft to the lead screw.

→ Dismantle the cover plate of the lead screw and feed rod.

→ Pull the O-ring on the drive shaft of the lead screw out of the groove and move it to the right side.

→ Drive out the shear pin using a pin punch. The shear pin is set off and can be driven out in one direction only.

→ Insert a new shear pin.

→ Insert the O-ring into the groove again and mount the cover plate.

6.4.5 Adjusting the spindle nut on the top slide

The spindle nut consists of two parts.

→ Loosen the axial securing screw next to the spindle nut.

→ Turn the spindle in clockwise direction until the spindle is locked. Then turn it slightly in clockwise direction, until it moves easily.

→ Tighten the securing screws again and check the mobility of the spindle along the entire length.

6.4.6 Adjusting the spindle nut on the cross slide

The cross spindle nut consists of two parts.

→ Slightly loosen both hexagon sockets in the centre of the cross slide.

→ Tighten the intermediary threaded pin, so the cross spindle nut is spread with a wedge. This reduces the play in the thread.

→ Tighten the hexagon sockets again and check the mobility of the spindle along the entire length.

6.4.7 Adjusting the tapered gibs on the top slide and cross slide

The play on the guide tracks is adjusted and reduced via the tapered gibs. After setting the tapered gib, check movement in the guide tracks and re-tighten the counter screw of the tapered gib.

6.4.8 Lathe saddle

The play in the lathe saddle guidance can be adjusted by modifying the lower guidance.

6.4.9 Feed gear

The feed gear is designed as a sliding gear transmission. Shear pins are used to protect the input shaft of the transmission against an overload. The feed rod itself is rigidly connected with the feed gear. The overload protection of the feed gear is one via the ball friction clutch in the apron.

6.4.10 Apron

The apron contains the gear box and switch elements for the longitudinal feed and cross feed as well as the lead screw nut of the lead screw. The oil filling of the case lubricates all items. The apron transmission is designed as a drop worm with an adjustable drop worm trigger, dependant on torque.

An adjustable ball friction clutch in the drop worm limits the potential feed force to ca. 5 KN in order to protect the apron with feed gear against an overload.

The manual hand pump for central lubrication system is supplied with the oil from the apron.

ATTENTION!

The ball friction clutch cannot be adjusted, otherwise the transmission might get damaged.

6.4.11 Spindle bearing tailstock

The tailstock quill is axially supported with needle bearings and supported with slide bearings in the opposite direction. The play in the bearings can be set after disassembling the handwheel with scale ring by adjusting the shims before the axial ring of the needle bearings.

6.4.12 Switching shaft rotational direction lever

The switching mechanism consists of a control dish which activates two position switches via balls. In the centre position, both position switches are pressed. The main spindle starts running when one of the position switches is released. The engagement travel can be changed by changing the effective lever length of the lever on the hexagon of the switching shaft. The switching mechanism is fixed in the machine bed and can be moved in the slots.

6.4.13 Feed rod

The feed rod is maintenance-free and stored in deep groove ball bearings which are sealed on both side. Re-lubcrication is not necessary.

6.4.14 Lubricating and cleaning the lathe chuck

ATTENTION!

Do not use compressed air to remove dust and foreign substances from the lathe chuck.

Coolant squirts on the lathe chuck and removes the grease from the master jaws. In order to maintain the tensioning force and the long-term accuracy of the lathe chuck, the lathe chuck must be lubricated regularly. Insufficient lubrication will result in malfunctions at reduced tensioning force, which affects the accuracy and causes excessive wear and seizing.

Depending on the chuck type and operating state, the tensioning force of a lathe chuck can decrease by up to 50 percent of the nominal tensioning force.

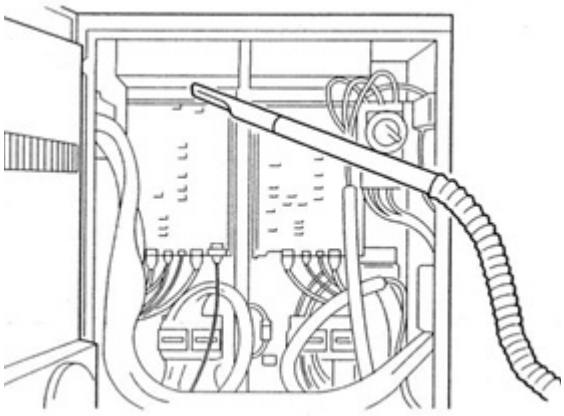
A presumably securely clamped workpiece can then fall out of the chuck during processing.

Lubricate the lathe chuck. Lubricate the lathe chuck at least once per week. The used lubricant should be of high quality and provided for high pressure bearing surfaces. The lubricant should withstand the coolant and other chemicals.

Numerous different lathe chucks are available on the market which distinguish themselves considerably based on the lubricating method. Follow the operating instructions of the corresponding lathe chuck manufacturer.

6.4.15 Cleaning the electrical cabinet

Although the electrical cabinet is constructed to shut off external air, foreign particles such as dust and dirt may enter the cabinet when the door is open.



Accumulation of foreign particles on the printed circuit boards or other electronic components could cause machine malfunction.

Clean the inside of the electrical cabinet regularly.

Remove dust inside electrical cabinet with a vacuum cleaner. Do not use compressed air to clean the electrical cabinet.

Never touch circuit boards or parts around the connector. Also avoid hitting these parts with the vacuum.

We recommend that the electrical cabinet is cleaned every 1000 operating hours .

6.5 Repair

6.5.1 Customer service technician

For any repair work request the assistance of an authorised customer service technician. Contact your specialist dealer if you do not have customer service's information or contact Stürmer Maschinen GmbH in Germany who can provide you with a specialist dealer's contact information. Optionally, the

Stürmer Maschinen GmbH

Dr.-Robert-Pfleger-Str. 26

D- 96103 Hallstadt, Germany

can provide a customer service technician, however, the request for a customer service technician can only be made via your specialist dealer.

If the repairs are carried out by qualified technical personnel, they must follow the indications given in these operating instructions.

Optimum Maschinen Germany GmbH accepts no liability nor does it guarantee against damage and operating malfunctions resulting from failure to observe these operating instructions.

For repairs, only use

- faultless and suitable tools,
- original parts or parts from series expressly authorised by Optimum Maschinen Germany GmbH.

6.6 Cooling lubricants and tanks

CAUTION!

The cooling lubricant can cause diseases. Avoid direct contact with cooling lubricant or parts covered in cooling lubricant.

Cooling lubricant circuits and tanks for water-cooling lubricant mixtures must be completely emptied, cleaned and disinfected as needed, but at least once per year or every time the cooling lubricant is replaced.

If fine chips and other foreign matters are accumulated in the coolant tank, the machine can no longer be correctly supplied with coolant. Furthermore, the lifetime of the coolant pump is reduced.

When processing cast iron or similar materials generating fine chips, cleaning the coolant tank more often is recommended.

Limit values

The cooling lubricant must be replaced, the cooling lubricant circuit and tank emptied, cleaned and disinfected if

- the pH value drops by more than 1 based on the value during initial filling. The maximum permissible pH value during initial filing is 9.3
- there is a perceivable change in the appearance, odour, floating oil or increase of the bacteria to more than 10/6/ml
- there is an increase in nitrite content to more than 20 ppm (mg/1) or nitrate content to more than 50 ppm (mg/1)
- there is an increase in the N-nitrosodiethanolamine (NDELA) to more than 5 ppm (mg/a)

CAUTION!

Comply with the manufacturer's specifications for mixture ratios, hazardous substances, e.g. system cleaners, including their permissible minimum use times.

CAUTION!

Since the cooling lubricant escapes under high pressure, pumping out the coolant by using the existing cooling lubricant pump via a pressure hose into a suitable tank is not recommended.

ENVIRONMENTAL PROTECTION

During work on the cooling lubricant equipment please make sure that

- **collector tanks are used with sufficient capacity for the amount of liquid to be collected.**
- **liquids and oils should not be spilled on the ground.**

Clean up any spilled liquid or oils immediately using proper oil-absorption methods and dispose of them in accordance with current statutory environmental regulations.

Collect leakages

Do not re-introduce liquids spilled outside the system during repair or as a result of leakage from the reserve tank, instead collect them in a collecting container for disposal.

Disposal

Never dump oil or other substances which are harmful to the environment into water inlets, rivers or channels. Used oils must be delivered to a collection centre. Consult your supervisor if you do not know where the collection centre is.

6.6.1 Inspection plan for water-mixed cooling lubricants

Company: No.: Date: used cooling lubricant			
size to be checked	Inspection methods	Inspection intervals	Procedure and comment
noticeable changes	Appearance, odour	daily	Find and rectify causes, e.g. skim off oil, check filter, ventilate cooling lubricant system
pH value	Laboratory techniques electrometric with pH meter (DIN 51369) Local measurement method: with pH paper (Special indicators with suitable measuring range)	weekly [1)]	if pH value decreases > 0.5 based on initial filing: Measures in accordance manufacturer's recommendations > 1.0 based on initial filing: Replace cooling lubricant, clean cooling lubricant circulation system
Usage concentration	Manual refractometer	weekly [1)]	Method results in incorrect values with tramp oil content
Base reserve	Acid titration in accordance with Manufacturer's recommendation	as required	Method is independent of tramp oil content
Nitrite content	Test sticks method or laboratory method	weekly [1)]	> 20 mg/L nitrite: Replace cooling lubricant or part or inhibiting additives; otherwise NDELA (N-nitrosodiethanolamine) in the cooling lubricant system and in the air must be determined > 5 mg/L NDELA in the cooling lubricant system: Replacement, clean and disinfect cooling lubricant circulation system, find nitrite source and, if possible, rectify.
Nitrate/nitrite content of the preparation water, if this is not removed from the public grid	Test sticks method or laboratory method	as required	Use water from the public grid if there is water from the pubic grid has > 50 mg/l nitrate: Inform the waterworks

[1)] The specified inspection intervals (frequency) are based on continuous operation. Other operational conditions can result in other inspection intervals; exceptions are possible in accordance with Sections 4.4 and 4.10 of the TGS 611.

Editor:

Signature:

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7 Ersatzteile - Spare parts

7.1 Ersatzteilbestellung - *Ordering spare parts*

Bitte geben Sie folgendes an - *Please indicate the following :*

- Seriennummer - *Serial No.*
- Maschinenbezeichnung - *Machines name*
- Herstellungsdatum - *Date of manufacture*
- Artikelnummer - *Article no.*

Die Artikelnummer befindet sich in der Ersatzteilliste. *The article no. is located in the spare parts list.* Die Seriennummer befindet sich am Typschild. *The serial no. is on the rating plate.*

7.2 Hotline Ersatzteile - Spare parts Hotline

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

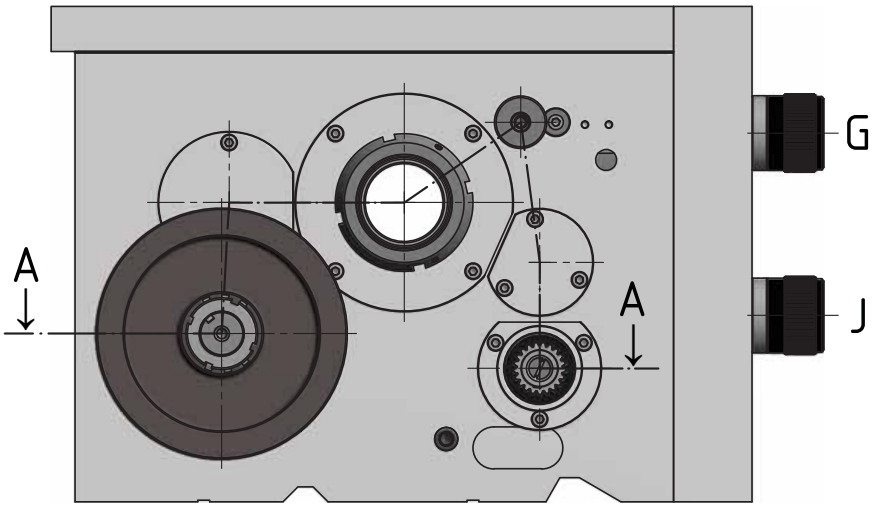
7.3 Service Hotline

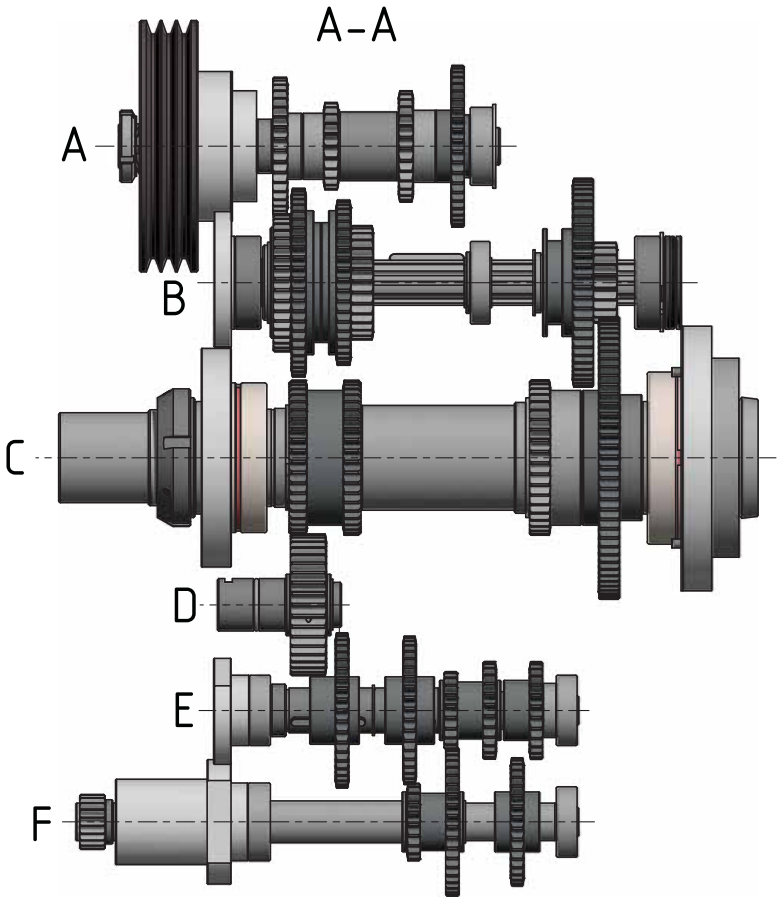
+49 (0) 951-96555 -100

service@stuermer-maschinen.de

7.4 Ersatzteilzeichnungen - Spare part drawings

A Spindelgetriebe - Headstock





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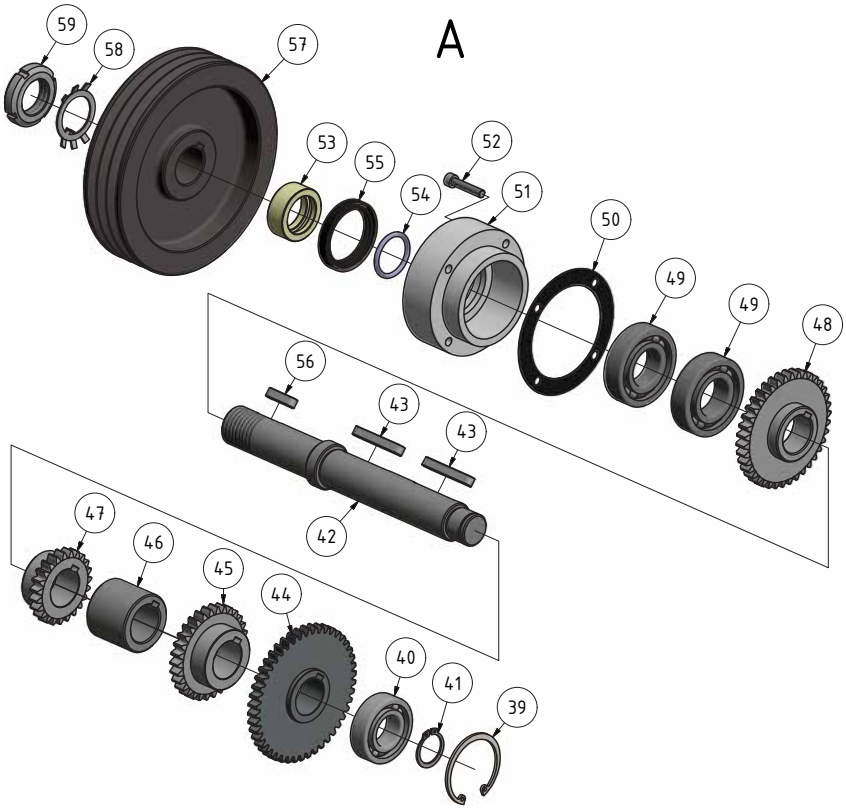
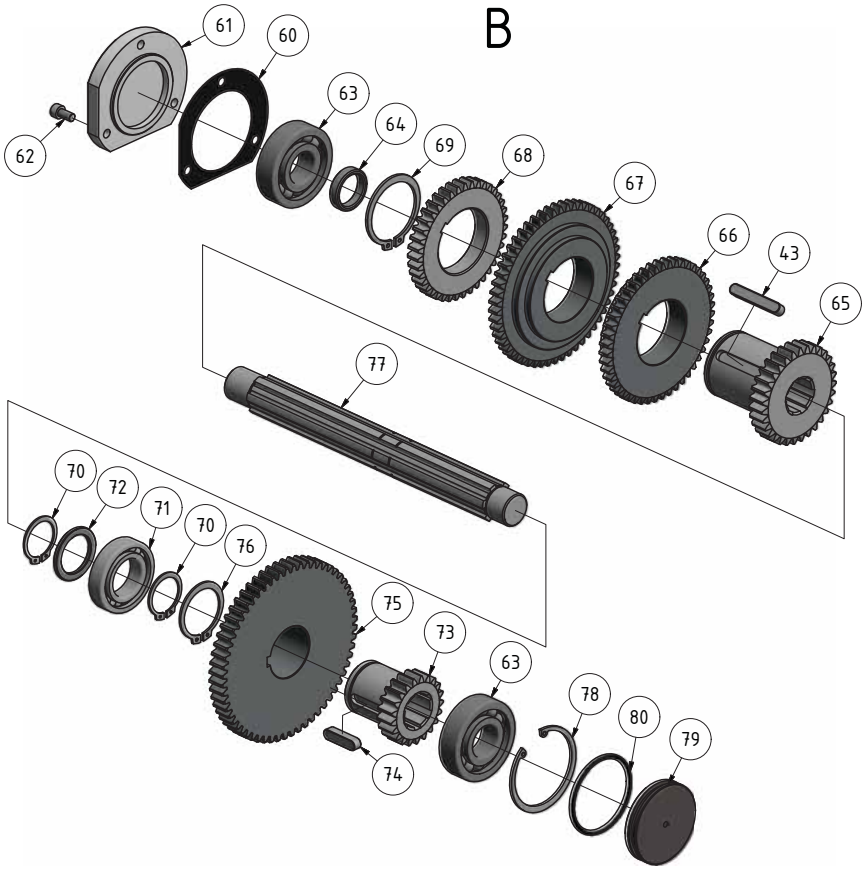
B Spindelgetriebe - Headstock - A



C Spindelgetriebe - Headstock - B



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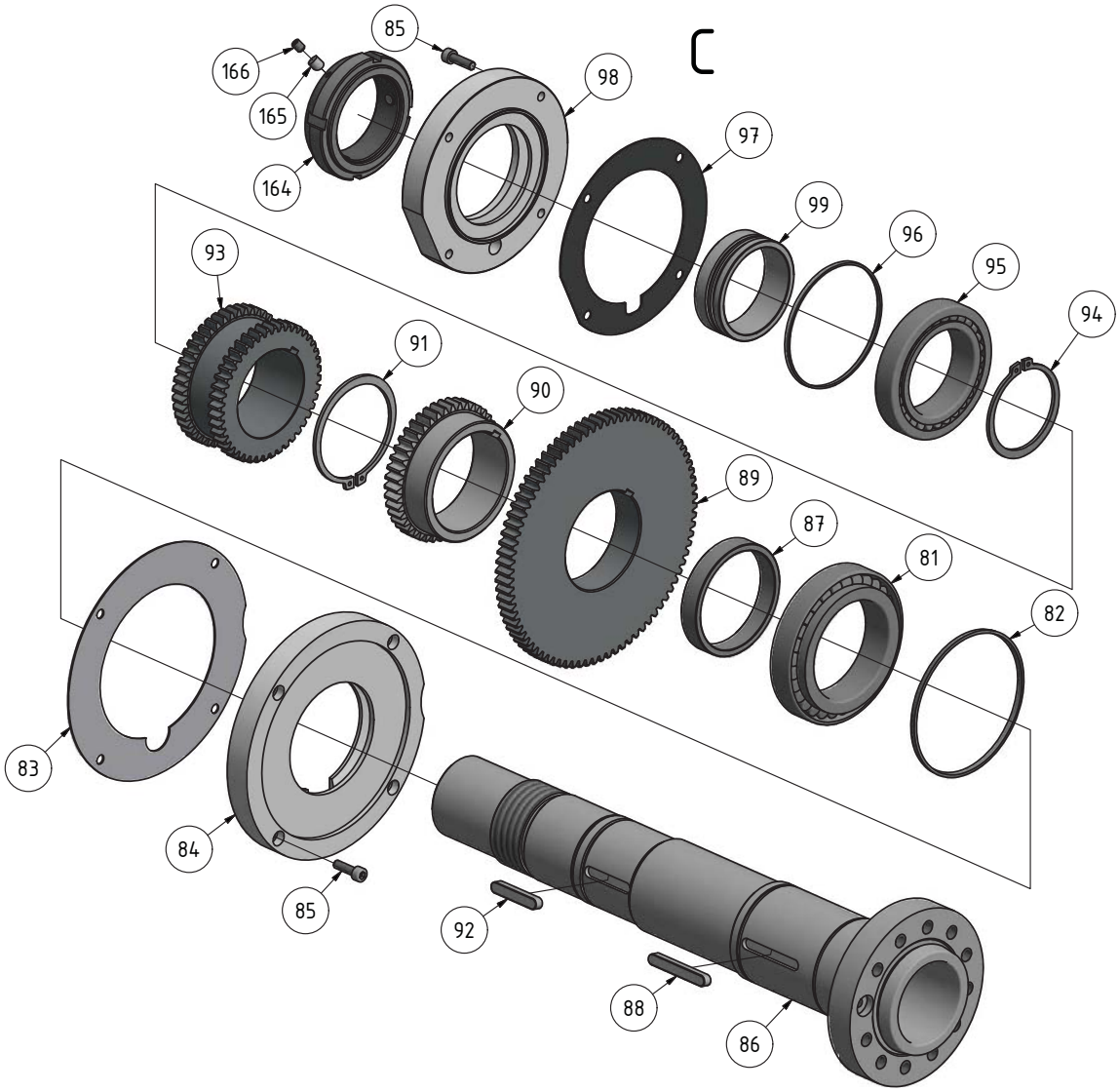
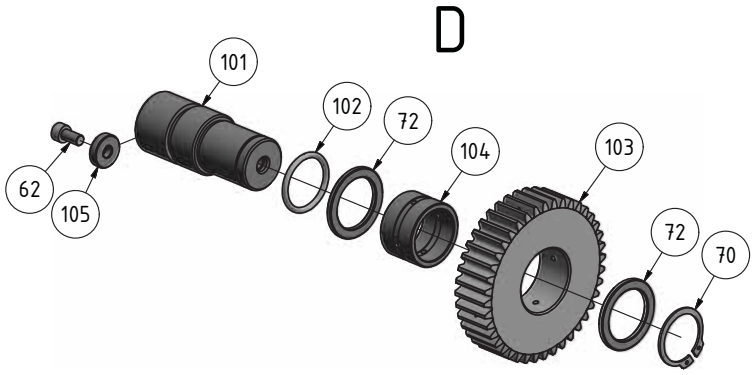
D Spindelgetriebe - Headstock - C



E Spindelgetriebe - Headstock - D



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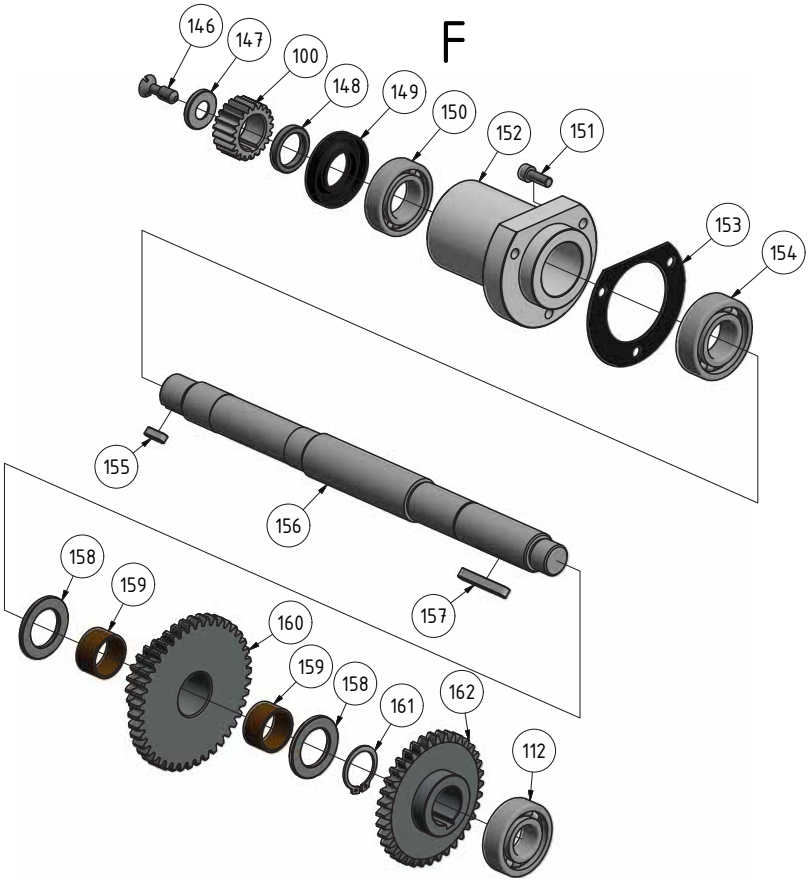
F Spindelgetriebe - Headstock - E

G Spindelgetriebe - Headstock - F



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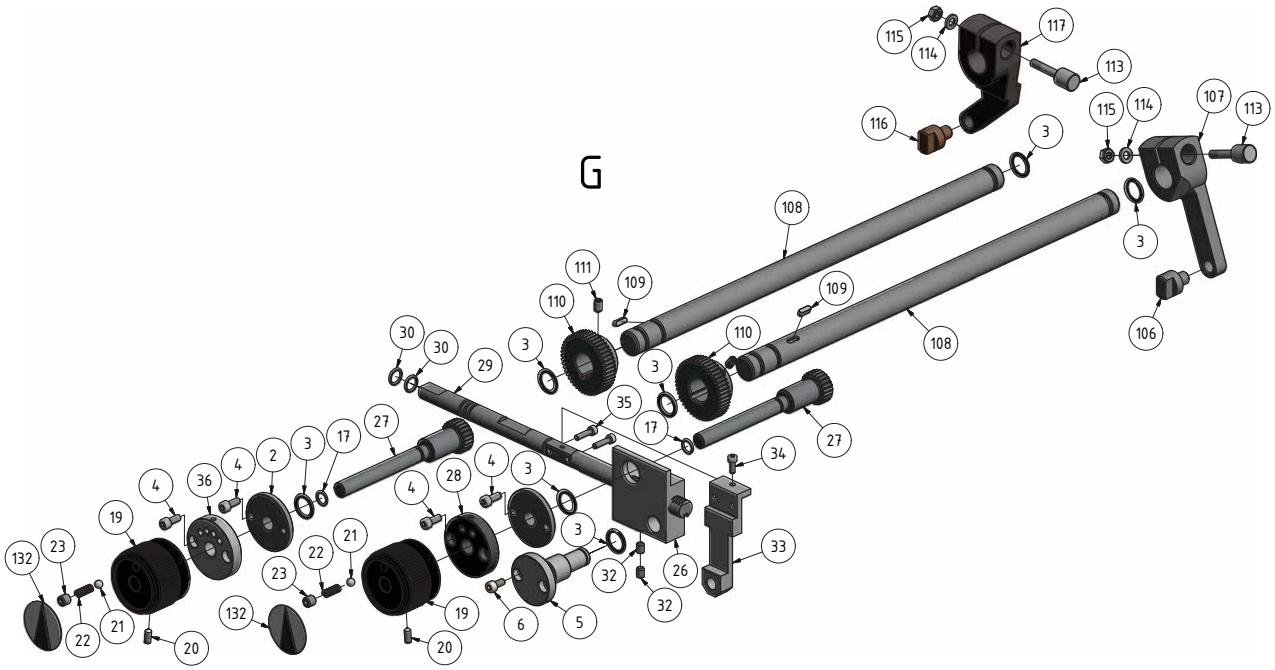
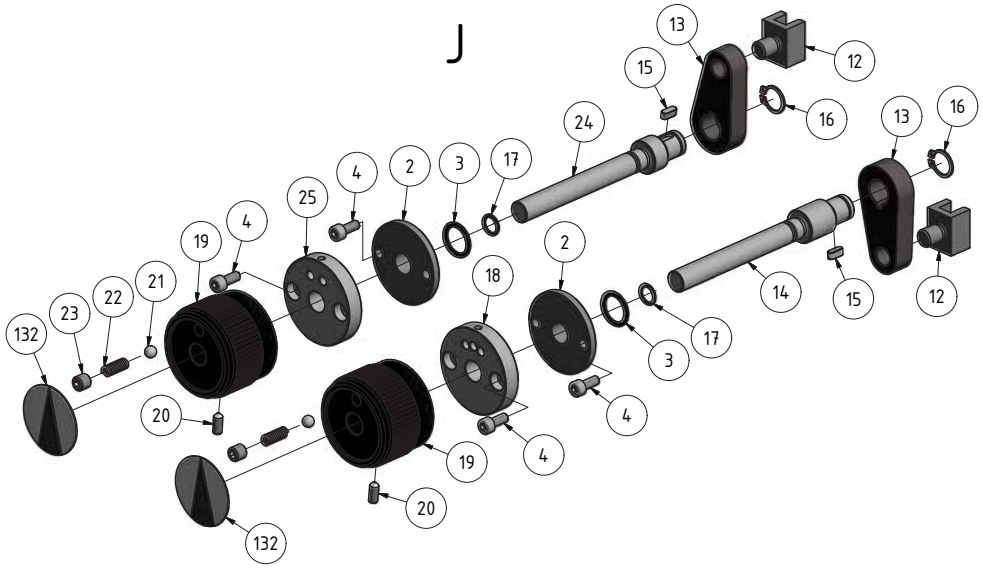
H Spindelgetriebe - Headstock - G



I Spindelgetriebe - Headstock - J



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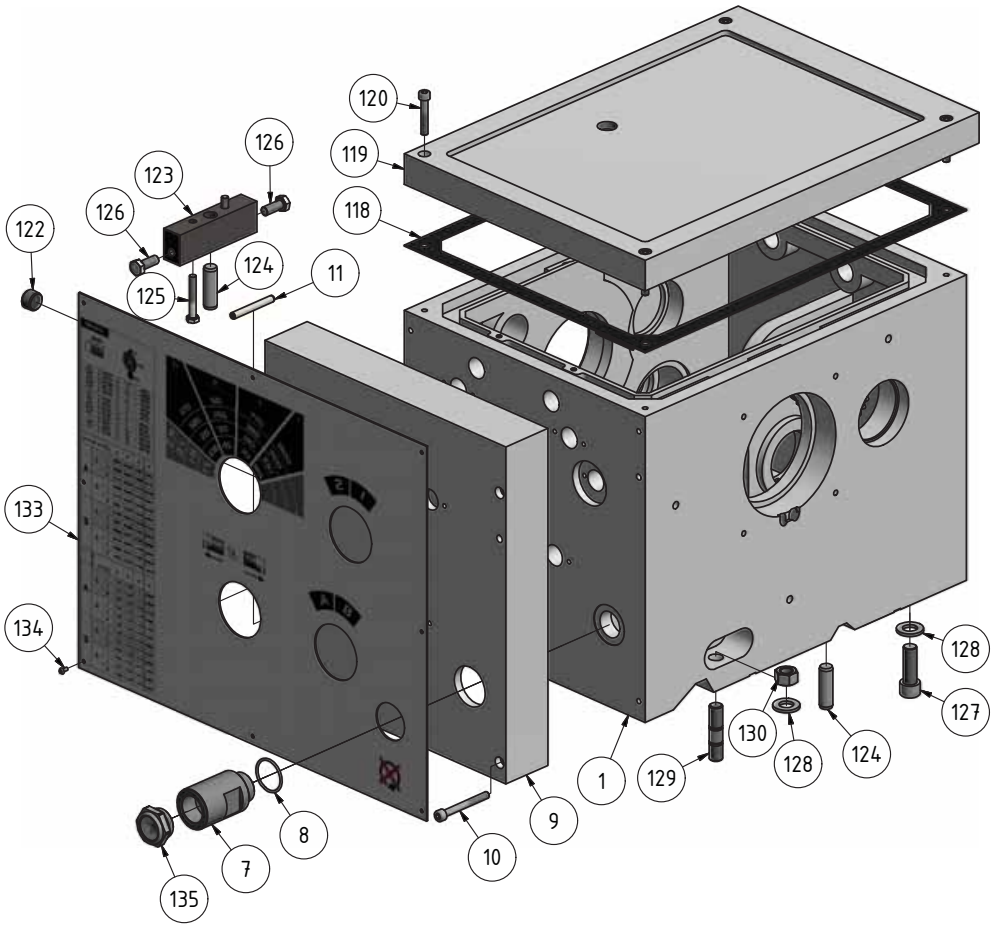
J Spindelgetriebe - Headstock



Ersatzteilliste Spindelgetriebe - Spare parts list headstock					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Gehäuse	Housing	1		
2	Scheibe	Washer	4		03432240102
3	O-Ring	O-Ring	9	15x2,65	
4	Innensechskantschraube	Socket head screw	16	M5x12	
5	Welle	Shaft	1		03432240105
6	Innensechskantschraube	Socket head screw	2	M5x10	
7	Buchse	Bushing	1		03432240107
8	O-Ring	O-Ring	1	32x1,9	
9	Abdeckung	Cover	1		
10	Schraube	Screw	4	M6x55	
11	Zylinderstift	Cylindrical pin	2	6x50	
12	Gabel	Fork	3		03432240112
13	Platte	Plate	2		03432240113
14	Welle	Shaft	1		03432240114
15	Passfeder	Fitting key	2	4x10	042P4410
16	O-Ring	O-Ring	3	14	042SR14I
17	O-Ring	O-Ring	4	8,75x1,8	
18	Wahlscheibe	Mode washer	1		03432240118
19	Wahlschalter	Mode washer	4		03432240119
20	Gewindestift	Grub screw	4	M5x12	
21	Stahlkugel	Stell ball	4	6	042KU06
22	Feder	Spring	4		
23	Gewindestift	Grub screw	4	M8x8	
24	Welle	Shaft	1		03432240124
25	Wahlscheibe	Mode washer	1		03432240125
26	Innensechskantschraube	Socket head screw	3	6x12	
27	Welle	Shaft	2		03432240127
28	Wahlscheibe	Mode washer	1		03432240128
29	Welle	Shaft	1		03432240129
30	O-Ring	O-Ring	2	14x1,9	
31	Flansch	Flange	1		03432240131

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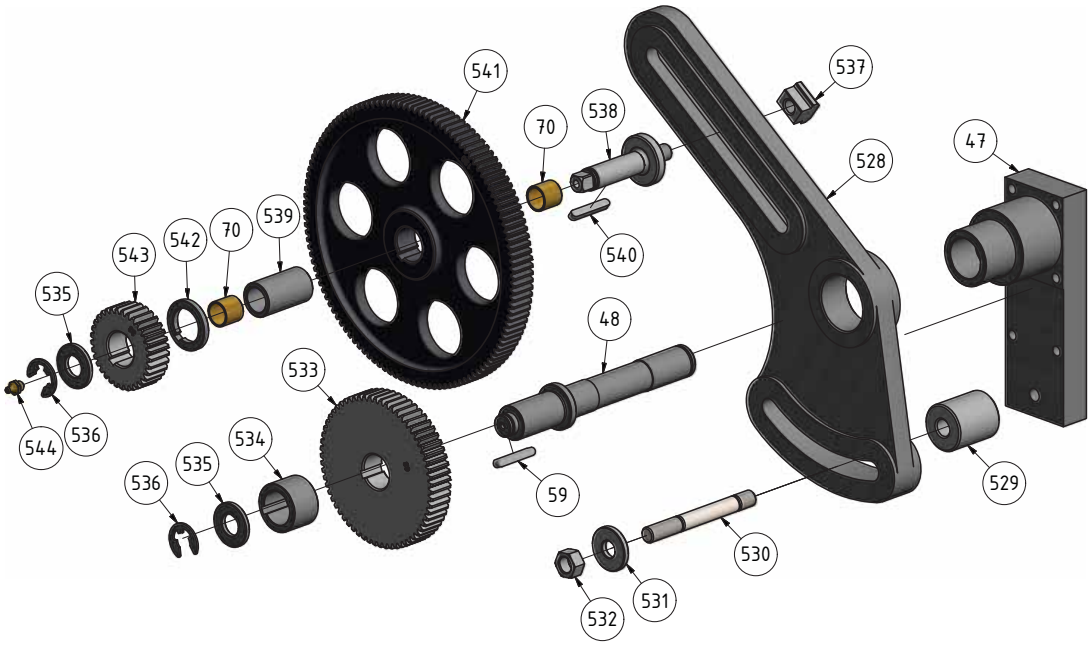
Ersatzteilliste Spindelgetriebe - Spare parts list headstock					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
32	Gewindestift	Grub Screw	2	M6x8	
33	Platte	Plate	1		03432240133
34	Innensechskantschraube	Socket head screw	1	M4x10	
35	Innensechskantschraube	Socket head screw	2	M4x16	
36	Wahlscheibe	Mode washer	1		03432240136
37	Dichtung	Seal	1		03432240137
38	Kugellager	Ball bearing	2	6204-2Z	0406204ZZ
39	Sicherungsring	Retaining ring	1	52	042SR52W
40	Kugellager	Ball bearing	1	6205-2Z	0406205ZZ
41	Sicherungsring	Retaining ring	1	25	042SR25W
42	Welle	Shaft	1		03432240142
43	Passfeder	Fitting key	3	8x50	
44	Zahnrad	Gear	1		03432240144
45	Zahnrad	Gear	1		03432240145
46	Buchse	Bushing	1		03432240146
47	Zahnrad	Gear	1		03432240147
48	Zahnrad	Gear	1		03432240148
49	Kugellager	Ball bearing	2	6206-2Z	0406206ZZ
50	Dichtung	Seal	1		03432240150
51	Lagerbock	Bearing block	1		03432240151
52	Innensechskantschraube	Socket head screw	4	M6x30	
53	Buchse	Bushing	1		03432240153
54	O-Ring	O-Ring	1	36x3,5	
55	Radialwellendichtring	Seal	1	45x55x8	
56	Passfeder	Fitting key	1	8x28	
57	Riemenscheibe	Belt pulley	1		03432240157
58	Sicherungsblech	Safery washer	1	30-GBT858	
59	Nutmuter	Grooved nut	1	M30x15	03432240159
60	Dichtung	Seal	1		03432240160
61	Flansch	Flange	1		03432240161
62	Innensechskantschraube	Socket head screw	4	M6x12	
63	Kugellager	Ball bearing	2	6305-2Z	0406305ZZ
64	Buchse	Bushing	1		03432240164
65	Zahnrad	Gear	1		03432240165
66	Zahnrad	Gear	1		03432240166
67	Zahnrad	Gear	1		03432240167
68	Zahnrad	Gear	1		03432240168
69	Sicherungsring	Retaining ring	1	50	042SR50W
70	Sicherungsring	Retaining ring	3	30	042SR30W
71	Kugellager	Ball bearing	1	6006-2Z	0406006ZZ
72	Ring	Retaining ring	3		03432240172
73	Zahnrad	Gear	1		03432240173
74	Passfeder	Fitting key	1	8x32	
75	Zahnrad	Gear	1		03432240175
76	Sicherungsring	Retaining ring	1	40	042SR40W
77	Zahnwelle	Gear shaft	1		03432240177
78	Sicherungsring	Retaining ring	1	62	042SR62I
79	Verschluss	Plug	1		03432240179
80	O-Ring	O-Ring	1	55x3,55	03432240180
81	Kegelrollenlager	Taper roller bearing	1	32015	04032015
82	Ring	Ring	1		03432240182
83	Dichtung	Seal	1		03432240183
84	Flansch	Flange	1		03432240184
85	Innensechskantschraube	Socket head screw	8	M6x20	
86	Spindel	Spindle	1		03432240186
87	Ring	Ring	1		03432240187
88	Passfeder	Fitting key	1	8x56	03432240188
89	Zahnrad	Gear	1		03432240189
90	Zahnrad	Gear	1		03432240190
91	Sicherungsring	Retaining ring	1	75	042SR75W
92	Passfeder	Fitting key	1	8x45	
93	Zahnrad	Gear	1		03432240193
94	Sicherungsring	Retaining ring	1	65	042SR65W
95	Kegelrollenlager	Taper roller bearing	1	32013	04032013
96	Ring	Ring	1		03432240196
97	Dichtung	Seal	1		03432240197
98	Flansch	Flange	1		03432240198
99	Hülse	Sleeve	1		03432240199
100	Zahnrad, 21 Z bei Lieferung montiert	Gear, 21 T mounted at delivery	1		034322401100
101	Welle	Shaft	1		034322401101
102	O-Ring	O-Ring	1	35	
103	Zahnrad	Gear	1		034322401103

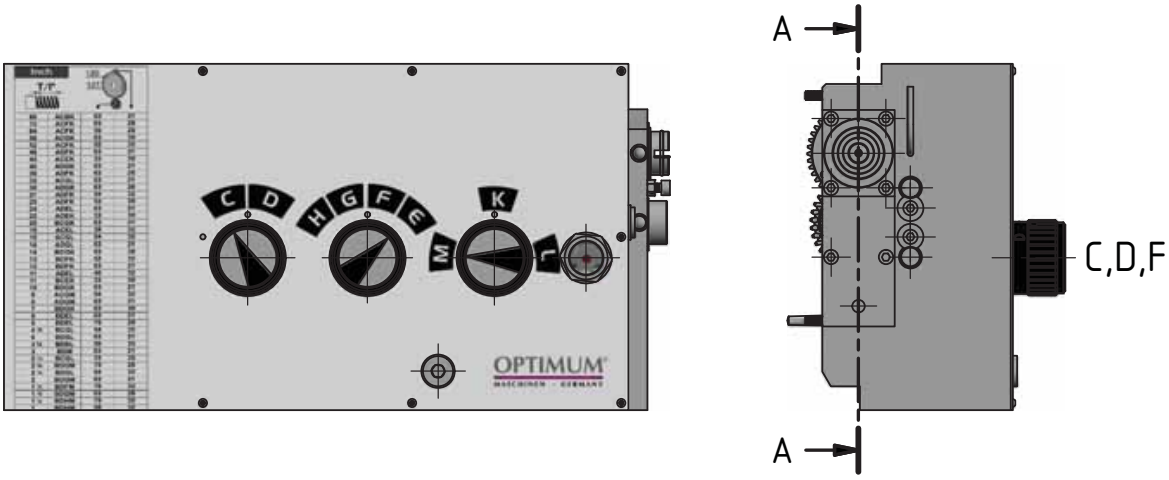
Ersatzteilliste Spindelgetriebe - Spare parts list headstock					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
104	Buchse	Bushing	1		034322401104
105	Scheibe	Washer	1		
106	Schaltgabel	Switch fork	1		034322401106
107	Schaltnocke	Switch cam	1		034322401107
108	Welle	Shaft	2		034322401108
109	Passfeder	Fitting key	2	4x12	042P4412
110	Zahnrad	Gear	2		034322401110
111	Gewindestift	Grub screw	2	M6x10	
112	Kugellager	Ball bearing	1	6204-2Z	0406204ZZ
113	Bolzen	Bolt	2		034322401113
114	Scheibe	Washer	2	6	
115	Sechskantmutter	Hexagon nut	2	M6	
116	Schaltgabel	Switch fork	1		034322401116
117	Schaltnocke	Switch cam	1		034322401117
118	Dichtung	Seal	1		034322401118
119	Deckel	Cover	1		
120	Innensechskantschraube	Socket head screw	4	M6x35	
121	Zahnrad	Gear	1		034322401121
122	Ablassschraube	Plug screw	1	Z3 8-G38	
123	Platte	Plate	1		034322401123
124	Zylinderstift	Cylindrical pin	2	12x40	
125	Sechskantschraube	Hexagon screw	2	M6x40	
126	Sechskantschraube	Hexagon screw	2	M8x20	
127	Innensechskantschraube	Socket head screw	2	M12x35	
128	Scheibe	Washer	4	12	
129	Bolzen	Bolt	2	M12x35	
130	Sechskantmutter	Hexagon nut	2	M12	
131	Sicherungsring	Retaining ring	1	30	042SR30W
132	Anzeige	Indicator	4		
133	Blende/Label	Label	1	TZ4	034322401133
133	Blende/Label	Label	1	TZ4V	034322471133
134	Schraube	Screw	8	M3x6	
135	Ölschauglas	Oil sight glass	1		034322401135
136	Zahnrad	Gear	1		034322401136
137	Welle	Shaft	1		034322401137
138	Passfeder	Fitting key	1	6x50	
139	Passfeder	Fitting key	1	6x32	
140	Passfeder	Fitting key	1	6x18	042P6618
141	Ring	Ring	2		
142	Buchse	Bushing	2		034322401142
143	Zahnrad	Gear	1		034322401143
144	Zahnrad	Gear	1		034322401144
145	Buchse	Bushing	1		034322401145
146	Schraube	Schraube	1		
147	Scheibe	Washer	1		
148	Ring	Ring	1		
149	Radialwellendichtring	Seal	1	25x47x8	04125478
150	Kugellager	Ball bearing	1	6005-2Z	0406005ZZ
151	Innensechskantschraube	Socket head screw	3	6x16	
152	Lagerbock	Bearing block	1		034322401152
153	Dichtung	Seal	1		034322401153
154	Kugellager	Ball bearing	1	6205-2Z	0406205ZZ
155	Passfeder	Fitting key	1	5x16	042P5516
156	Welle	Shaft	1		034322401156
157	Passfeder	Fitting key	1	6x40	
158	Scheibe	Washer	2		
159	Buchse	Bushing	2		034322401159
160	Zahnrad	Geat	1		034322401160
161	Sicherungsring	Retaining ring	1	25	042SR25W
162	Zahnrad	Gear	1		034322401162
163	Kugellager	Ball bearing	1	6204-2Z	0406204ZZ
164	Nutmutter	Groove nut	1		034322401164
165	Klemmstift	Clamping pin	3		034322401165
166	Gewindestift	Grubscrew	3	M6x8	

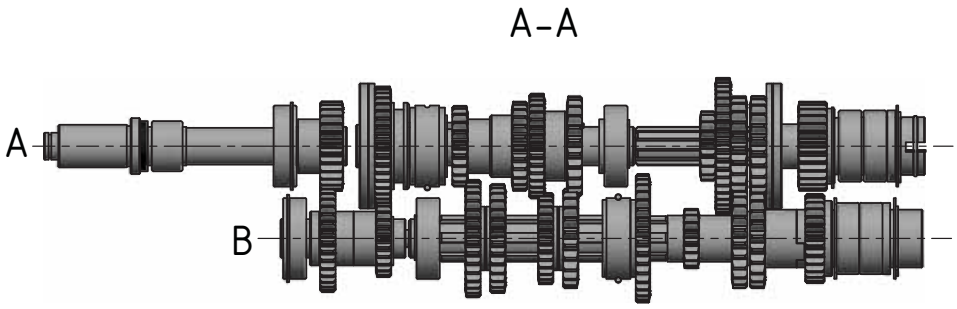
K Wechselräder - Change gear



Ersatzteilliste Wechselräder - Spare parts list change gear					
Pos.	**Bezeichnung**	**Description**	**Menge** **Qty.**	**Grösse** **Size**	**Artikelnummer** **Item no.**
47	Halter	Holder	2		03432240247
48	Welle	Shaft	2		03432240248
59	Passfeder	Fitting key	2	5x32	042P5530
70	Buchse	Bushing	4	SF-1-1415	03432240270
528	Wechselradschere	Change gear holder	1		034322402528
529	Buchse	Bushing	1		034322402529
530	Gewindebolzen	Grub screw	1	M10x75	
531	Scheibe	Washer	1		
532	Sechskantmutter	Hexogon nut	1	M10	
533	Zahnrad	Gear	1	63 Z bei Lieferung montiert 63 T mounted at delivery	034322402533
534	Buchse	Bushing	1		034322402534
535	Scheibe	Washer	2		
536	Sicherungsring	Retaining ring	2	12	042SR12I
537	Nutenstein	Slot nut	1		034322402537
538	Welle	Shaft	1		034322402538
539	Hülse	Sleeve	1		034322402539
540	Passfeder	Fitting key	1		
541	Zahnrad, 120 Z bei Lieferung montiert	Gear 120 T mounted at delivery	1		034322402541
542	Ring	Ring	1		034322402542
543	Zahnrad, 33 Z bei Lieferung montiert	Gear, 33T mounted at delivery	1		034322402543
544	Schmiernippel	Lubrication cup	1	M6	
0	Satz Wechselzahnräder	Set of change gears	1	22 , 28 , 30 , 32 , 34 , 38 , 46 , 52 , 54 , 56 , 70 , 100 , 110 , 127	3444160

L Vorschubgetriebe - Feed gear





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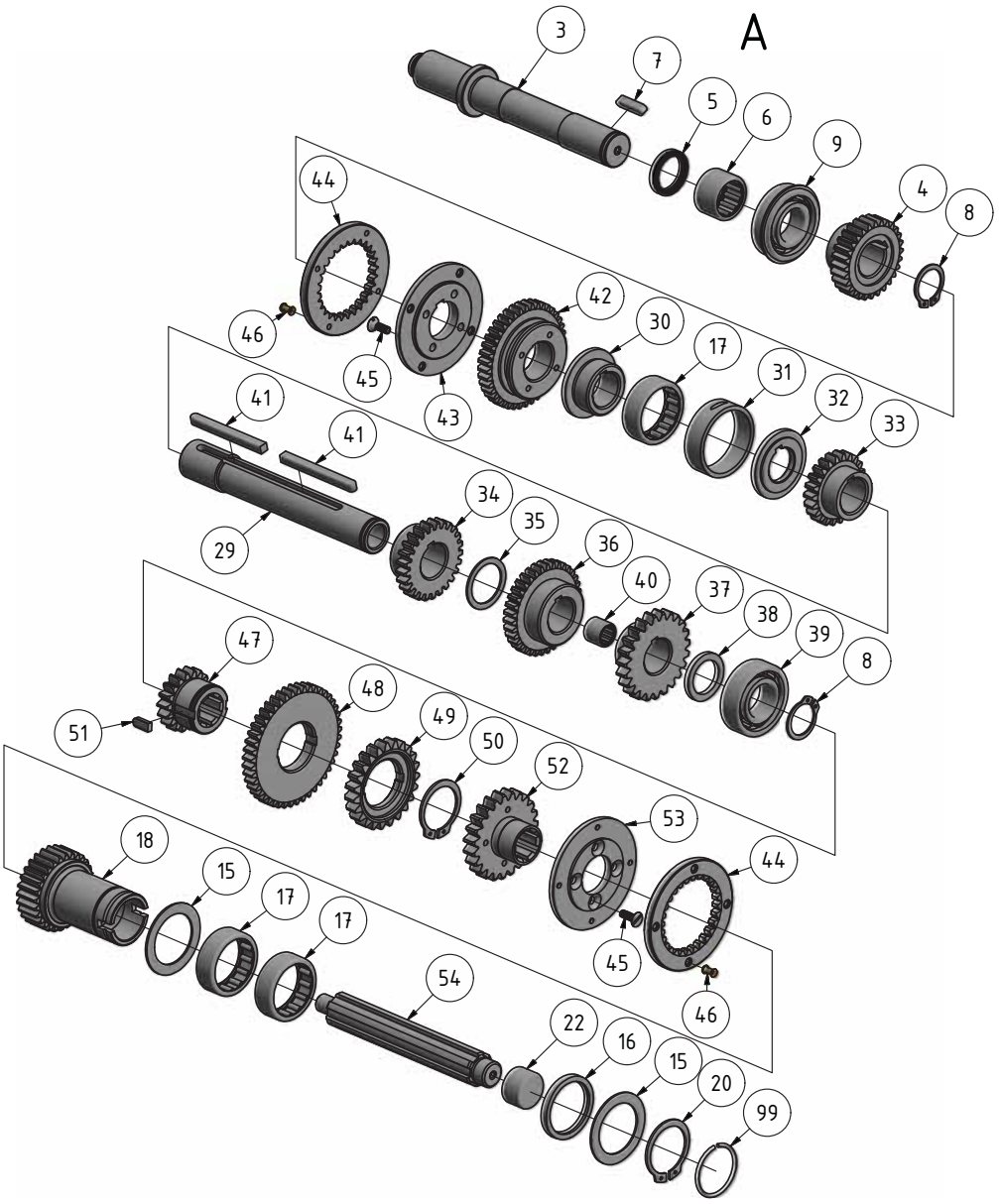
M Vorschubgetriebe - Feed gear



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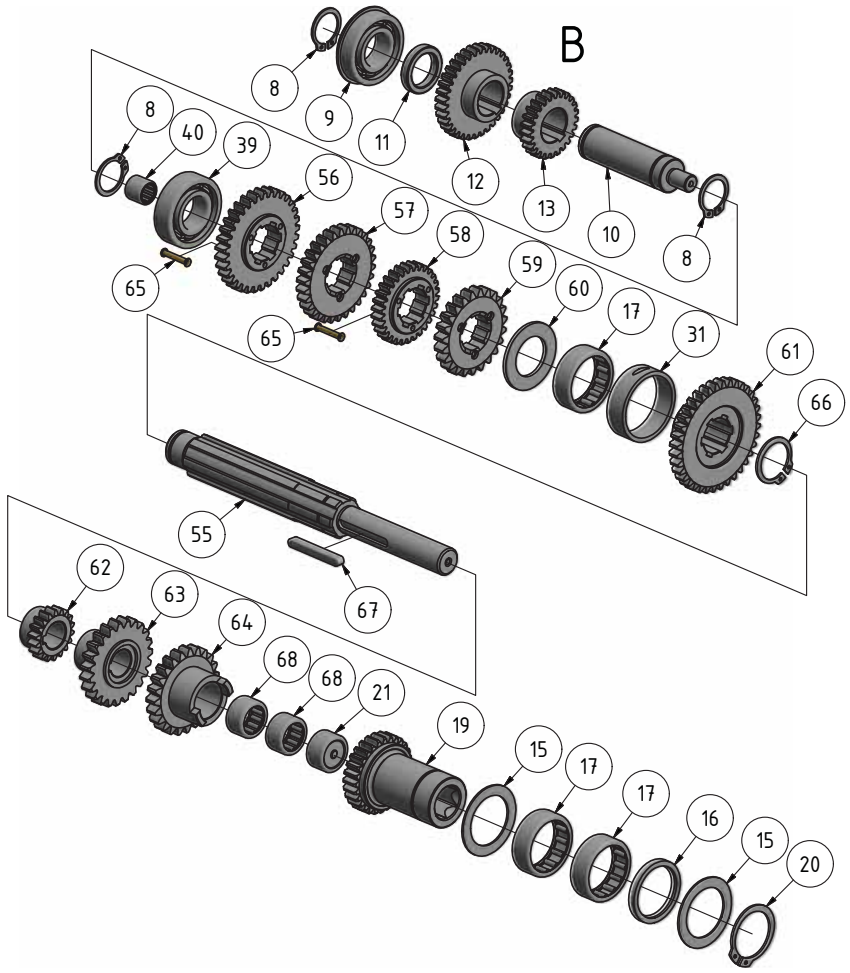
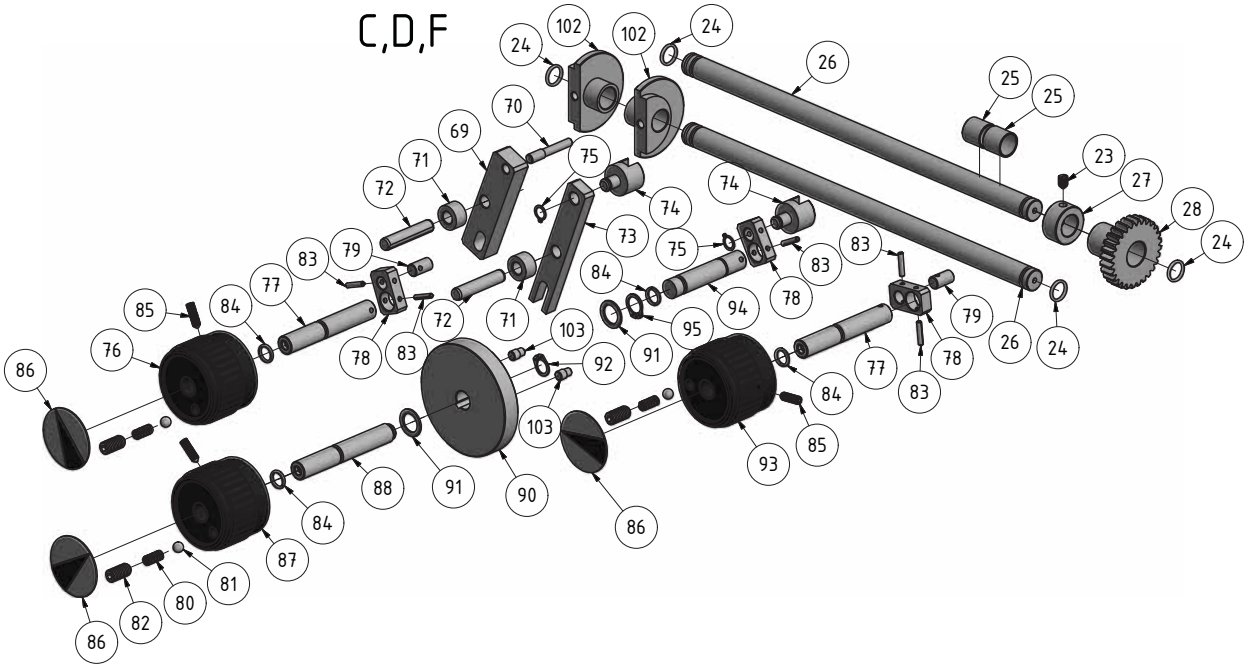
N Vorschubgetriebe - Feed gear



O Vorschubgetriebe - Feed gear



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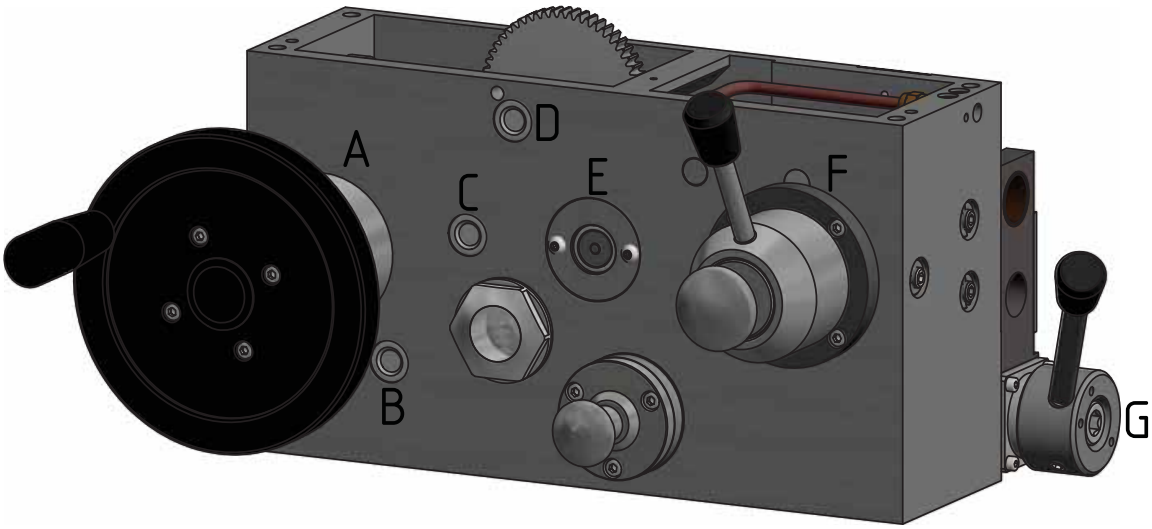
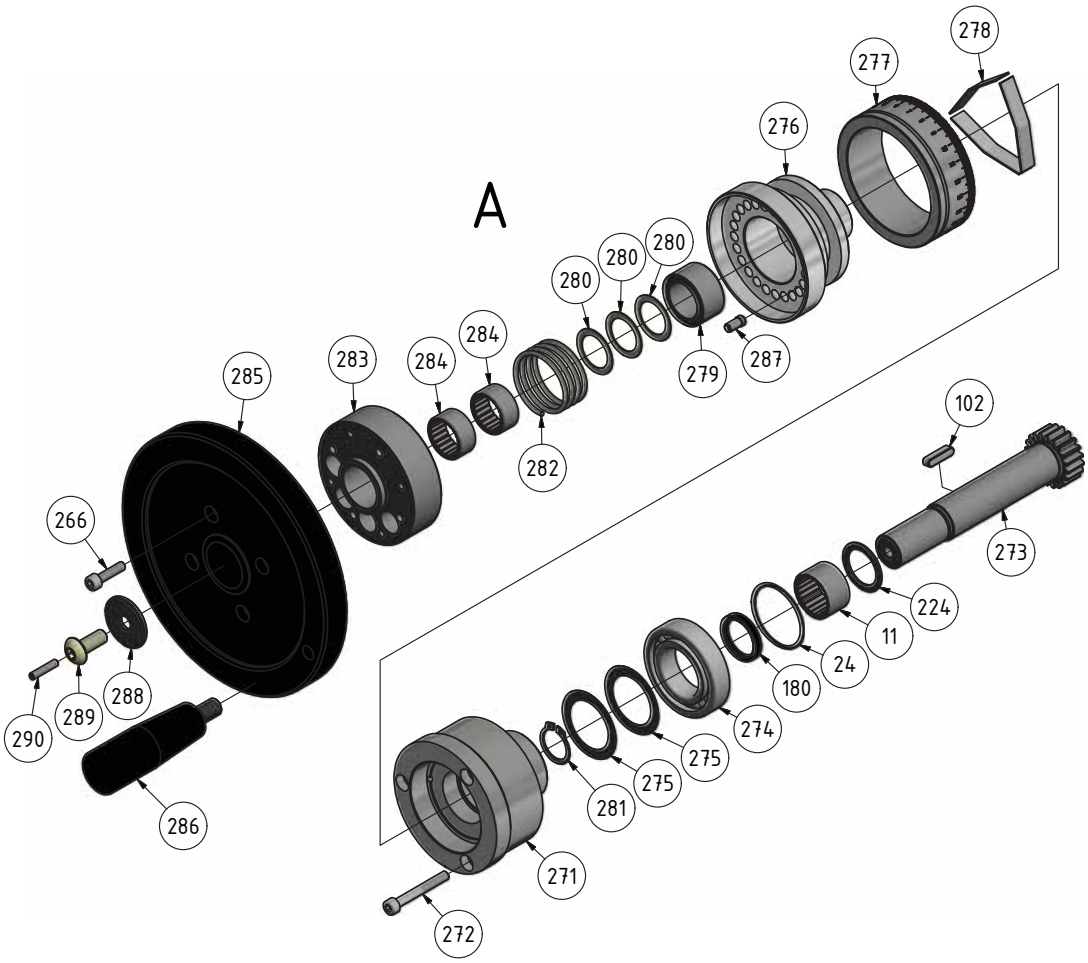
Ersatzteilliste Vorschubgetriebe - Spare parts list feed gear					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Gehäuse	Housing	1		03432240301
2	Lagerbock	Bearing block	1		03432240302
3	Welle	Shaft	1		03432240303
4	Zahnrad	Gear	1		03432240304
5	Radialwellendichtring	Seal	1	TC20x26x4	
6	Nadellager	Needle bearing	1	DHK2016	03432240306
7	Passfeder	Fitting key	1	5x20	042P5520
8	Sicherungsring	Retaining ring	3	20	042SR20W
9	Kugellager	Ball bearing	2	D6004N	03432240309
10	Welle	Shaft	1		03432240310
11	Ring	Ring	1		
12	Zahnrad	Gear	1		03432240312
13	Zahnrad	Gear	1		03432240313
15	Ring	Ring	4	DIN988-30-42-1	
16	Radialwellendichtring	Seal	2	TC30x37x4	
17	Nadellager	Needle bearing	4	DHK3012	040NN3012
18	Zahnwelle	Gear shaft	1		03432240318
19	Zahnwelle	Gear shaft	1		03432240319
20	Sicherungsring	Retaining ring	2	30	042SR30W
22	Nadellager	Needle bearing	1	DBK1512	
23	Gewindestift	Grub screw	1	M6x8	
24	O-Ring	O-Ring	4	10,6x1,8	
25	Buchse	Bushing	2	SF-1-1415	03432240325
26	Welle	Shaft	2		03432240326
27	Buchse	Bushing	1		03432240327
28	Zahnrad	Gear	1		03432240328
29	Welle	Shaft	1		03432240329
30	Buchse	Bushing	1		03432240330
31	Ring	Ring	1		03432240331
32	Ring	Ring	1		03432240332
33	Zahnrad	Gear	1		03432240333
34	Zahnrad	Gear	1		03432240334
35	Ring	Ring	1		
36	Zahnrad	Gear	2		03432240336
37	Zahnrad	Gear	2		03432240337
38	Ring	Ring	1		
39	Kugellager	Ball bearing	1	6004	0406004
40	Nadellager	Needle bearing	2		03432240340
41	Passfeder	Fitting key	2	5x56	
42	Zahnrad	Gear	1		03432240342
43	Flansch	Flange	1		03432240343
44	Zahnscheibe	Gear washer	2		03432240344
45	Schraube	Schrew	8	4x12	
46	Niet	Rivet	4		
47	Zahnrad	Gear	1		03432240347
48	Zahnrad	Gear	6		03432240348
49	Zahnrad	Gear	4		03432240349
50	Sicherungsring	Retaining ring	2	20	042SR20W
51	Passfeder	Fitting key	2	5x12	042P5512
52	Zahnrad	Gear	2		03432240352
53	Flansch	Flange	2		03432240353
54	Welle	Shaft	1		03432240354
55	Welle	Shaft	1		03432240355
56	Zahnrad	Gear	1		03432240356
57	Zahnrad	Gear	1		03432240357
58	Zahnrad	Gear	1		03432240358
59	Zahnrad	Gear	1		03432240359
60	Zahnrad	Gear	1		03432240360
61	Zahnrad	Gear	1		03432240361
62	Zahnrad	Gear	1		03432240362
63	Zahnrad	Gear	1		03432240363
64	Zahnrad	Gear	1		03432240364
66	Sicherungsring	Retaining ring	1	24	042SR24I
67	Passfeder	Fitting key	1	5x40	042P5540
68	Nadellager	Needle bearing	2	DHK1612	
69	Platte	Plate	1		03432240369
70	Welle	Shaft	1		03432240370
71	Buchse	Bushing	2		
72	Bolzen	Bolt	2		03432240372
73	Platte	Plate	1		03432240373
74	Schaltgabel	Fork switch	2		03432240374
75	Sicherungsring	Retaining ring	2	8	042SR8W

Ersatzteilliste Vorschubgetriebe - Spare parts list feed gear					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
76	Wahlschalter	Mode switch	1		03432240376
77	Welle	Shaft	2		03432240377
78	Block	Block	3		03432240378
79	Stift	Pin	2		03432240379
80	Feder	Spring	3	1x5x18	
81	Stahlkugel	Steel ball	3	6,5	042KU65
82	Gewindestift	Grub screw	3	M8x16	
83	Zylinderstift	Cylindrical pin	5	3x16	
84	O-Ring	O-Ring	4	8,75x1,8	
85	Gewindestift	Grub screw	3	M5x16	
86	Anzeige	Indicator	3		
87	Wahlschalter	Mode switch	1		03432240387
88	Welle	Shaft	1		03432240388
90	Scheibe	Washer	1		03432240390
91	Ring	Ring	2		
93	Wahlschalter	Mode switch	1		03432240393
94	Welle	Shaft	1		03432240394
95	Sicherungsring	Retaining ring	1	12	042SR12W
97	Verschlussschraube	Plug screw	2	M15x1,5	03432240397
98	O-Ring	O-Ring	2	16x1,5	
99	Ring	Ring	1		
100	Innensechskantschraube	Socket head screw	6	M6x30	
102	Exzenter	Eccentric	2		034322403102
103	Bolzen	Bolt	2		034322403103
107	Innensechskantschraube	Socket head screw	6	M6x135	
109	Sechskanzmutter	Hexagon nut	1	M6	
110	Innensechskantschraube	Socket head screw	1	M6x20	
111	Gewindestift	Grub screw	2	M6x12	
112	Hutmutter	Cap nut	2	M6	
113	Scheibe	Washer	2	6	
114	Blende/Label	Cover/Lable	1		034322403114
115	Ölschauglas	Oil sight glas	1		034322403115
117	Schraube	Screw	7	M3x6	

P Schlosskasten - Apron



Q Schlosskasten - Apron



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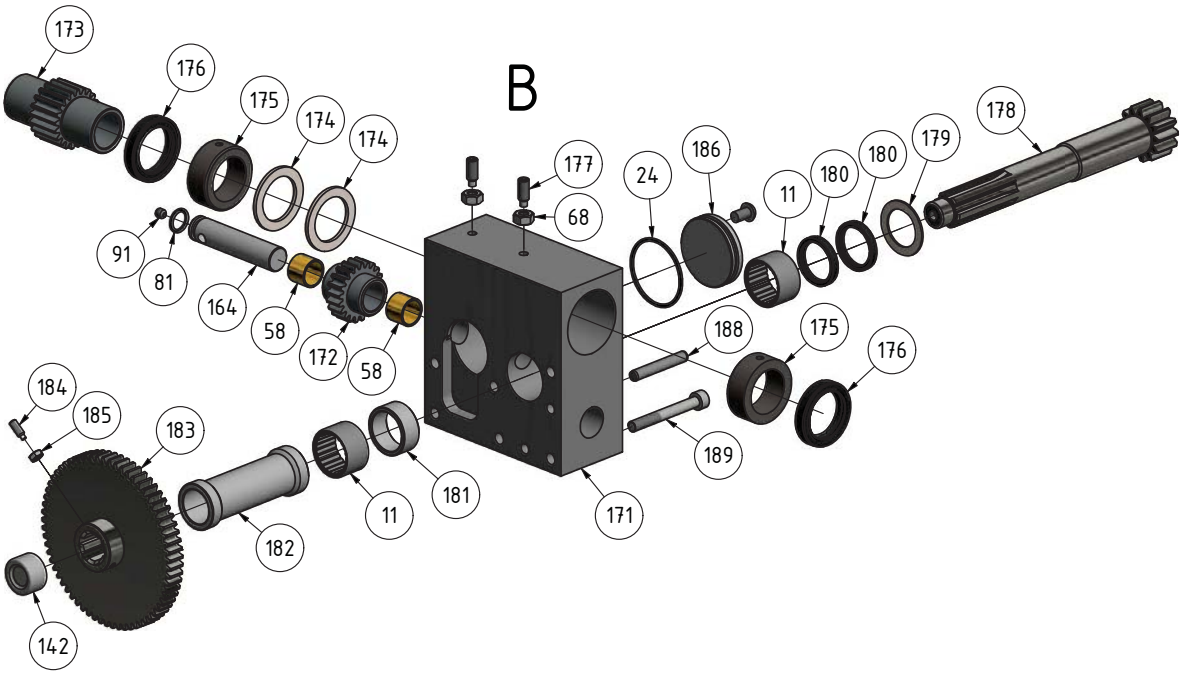
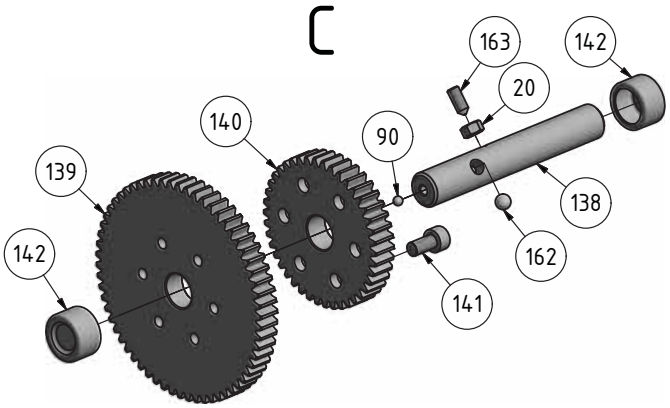
R Schlosskasten - Apron



S Schlosskasten - Apron



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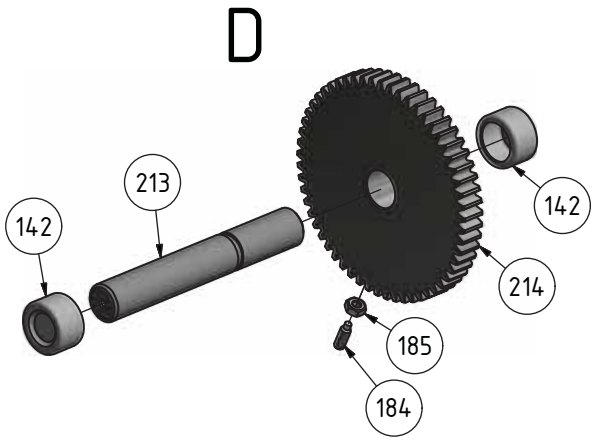
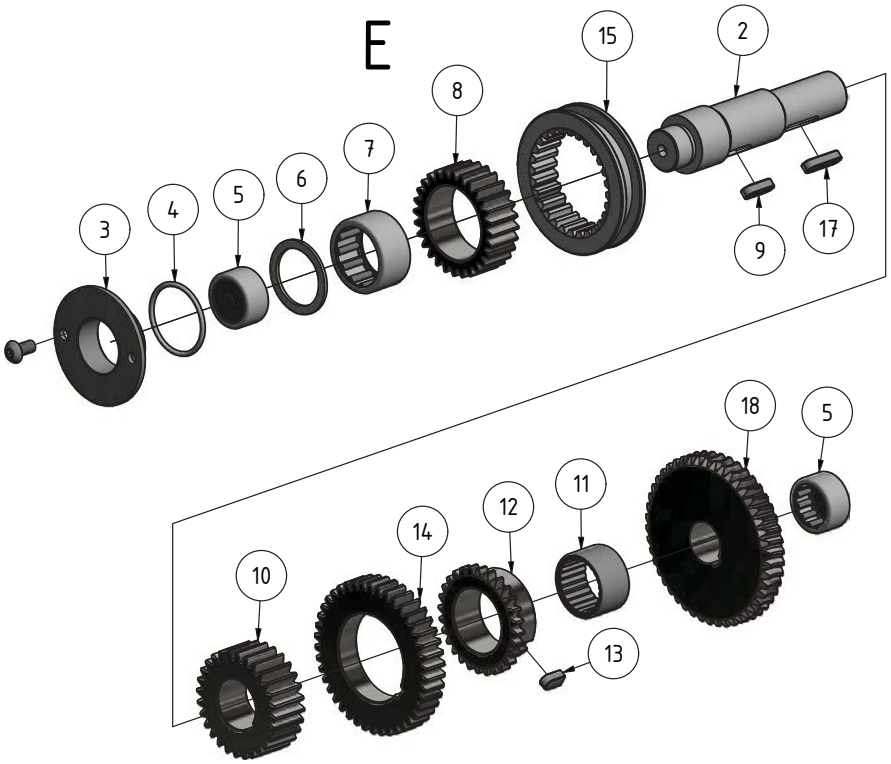
T Schlosskasten - Apron



U Schlosskasten - Apron



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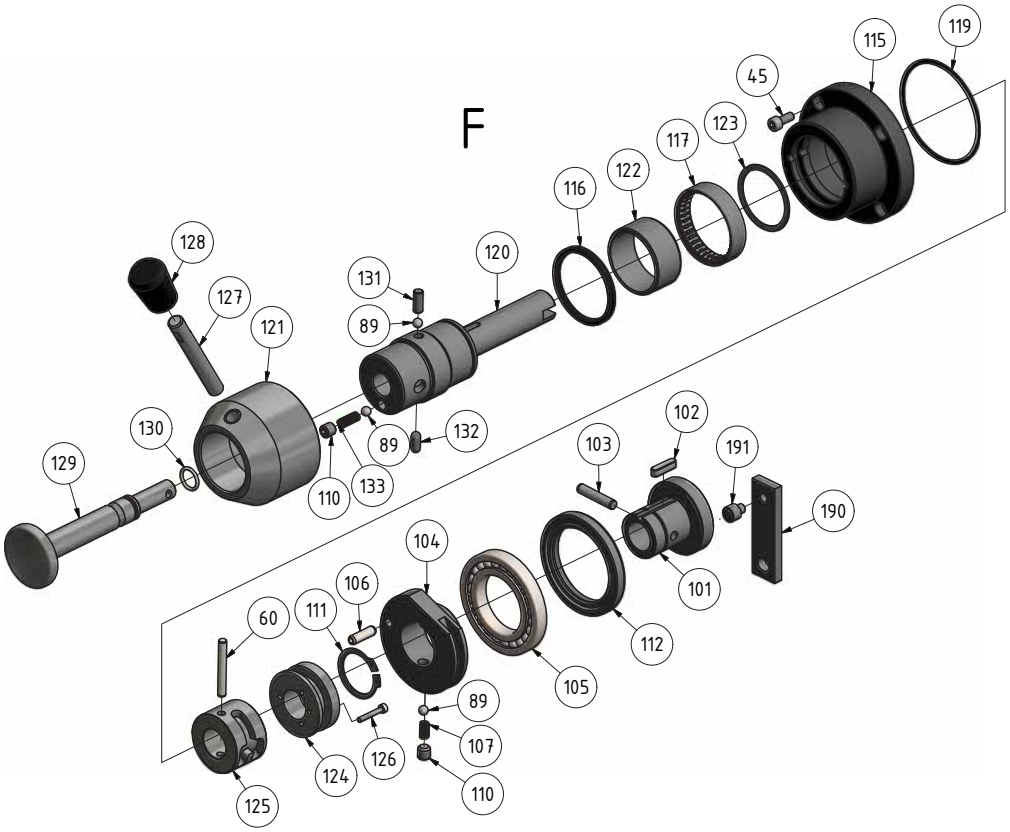
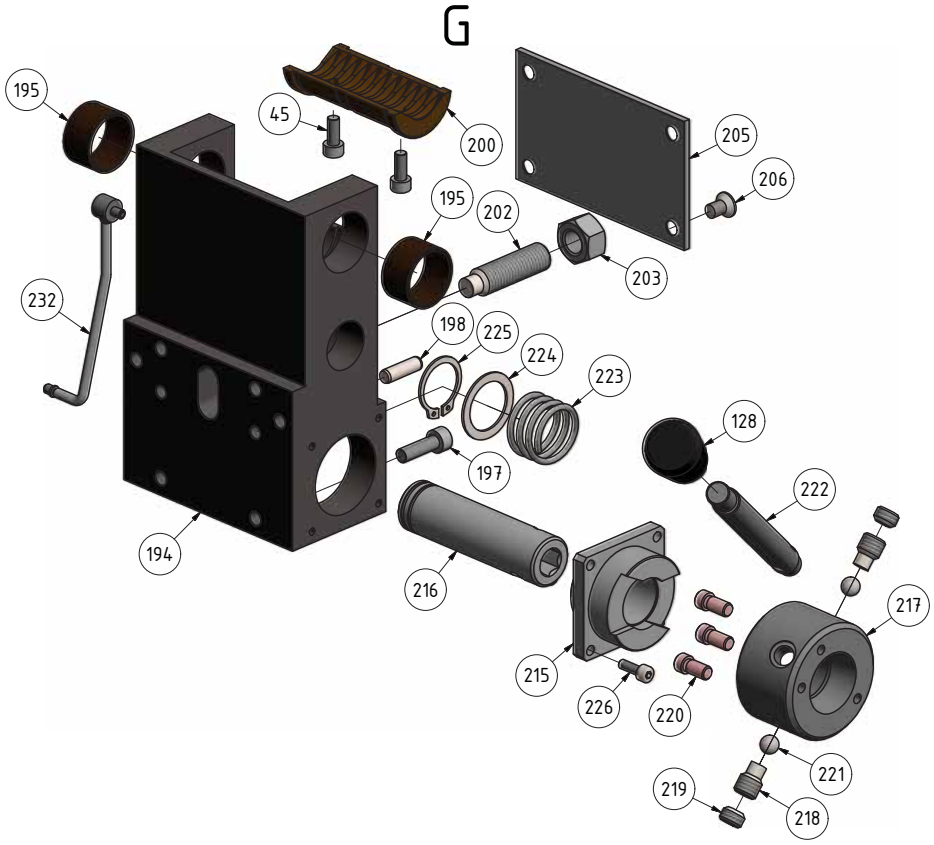
V Schlosskasten - Apron

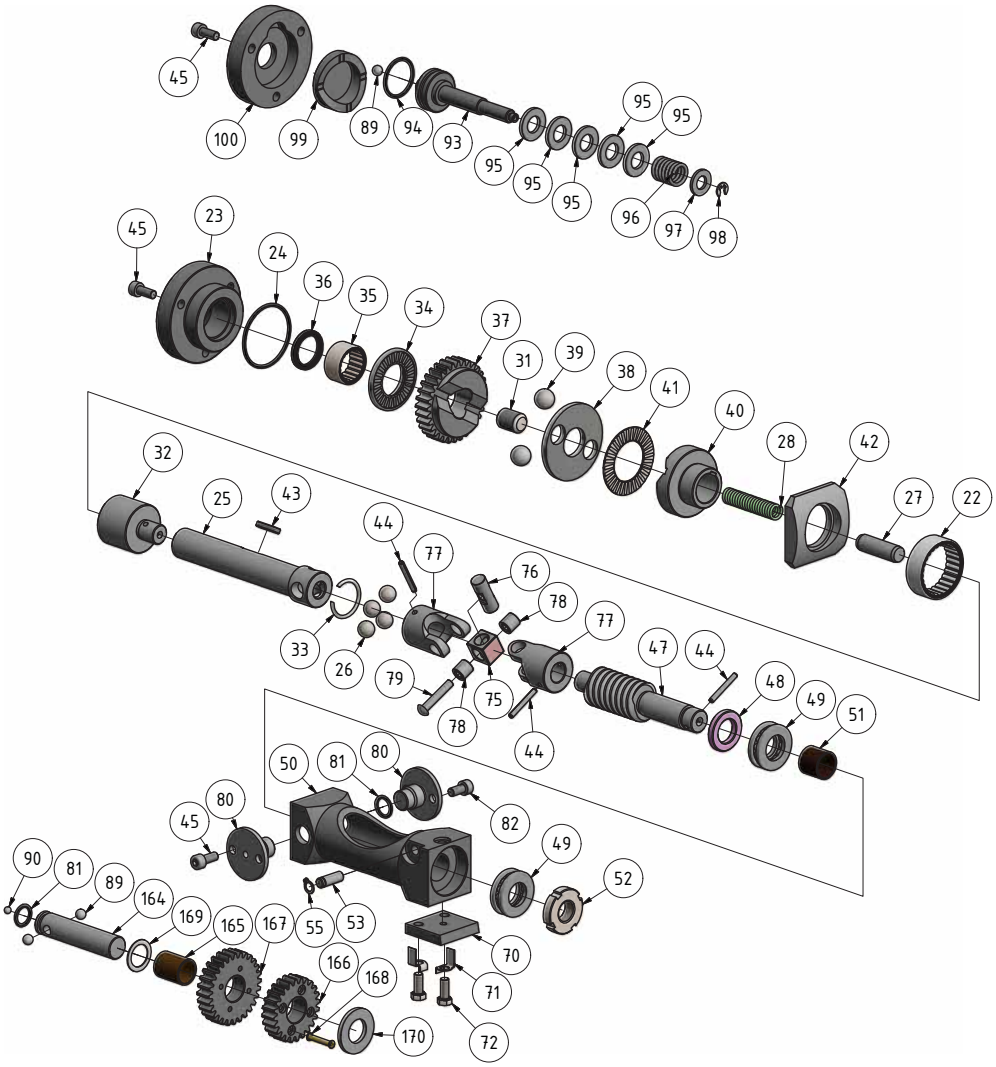


W Schlosskasten - Apron

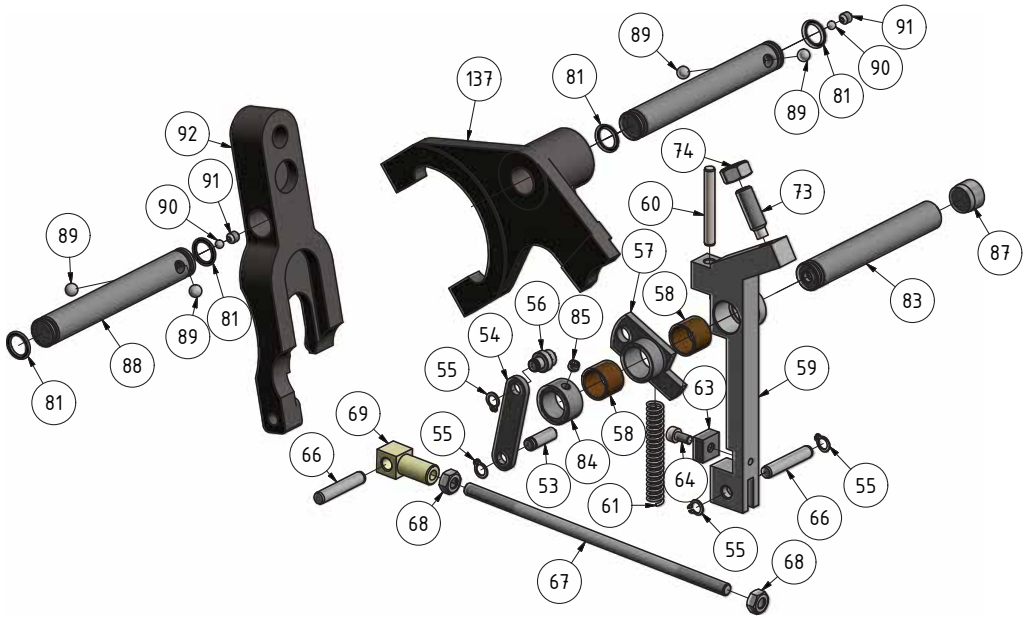


TZ4_parts.fm

X Schlosskasten - Apron



Y Schlosskasten - Apron



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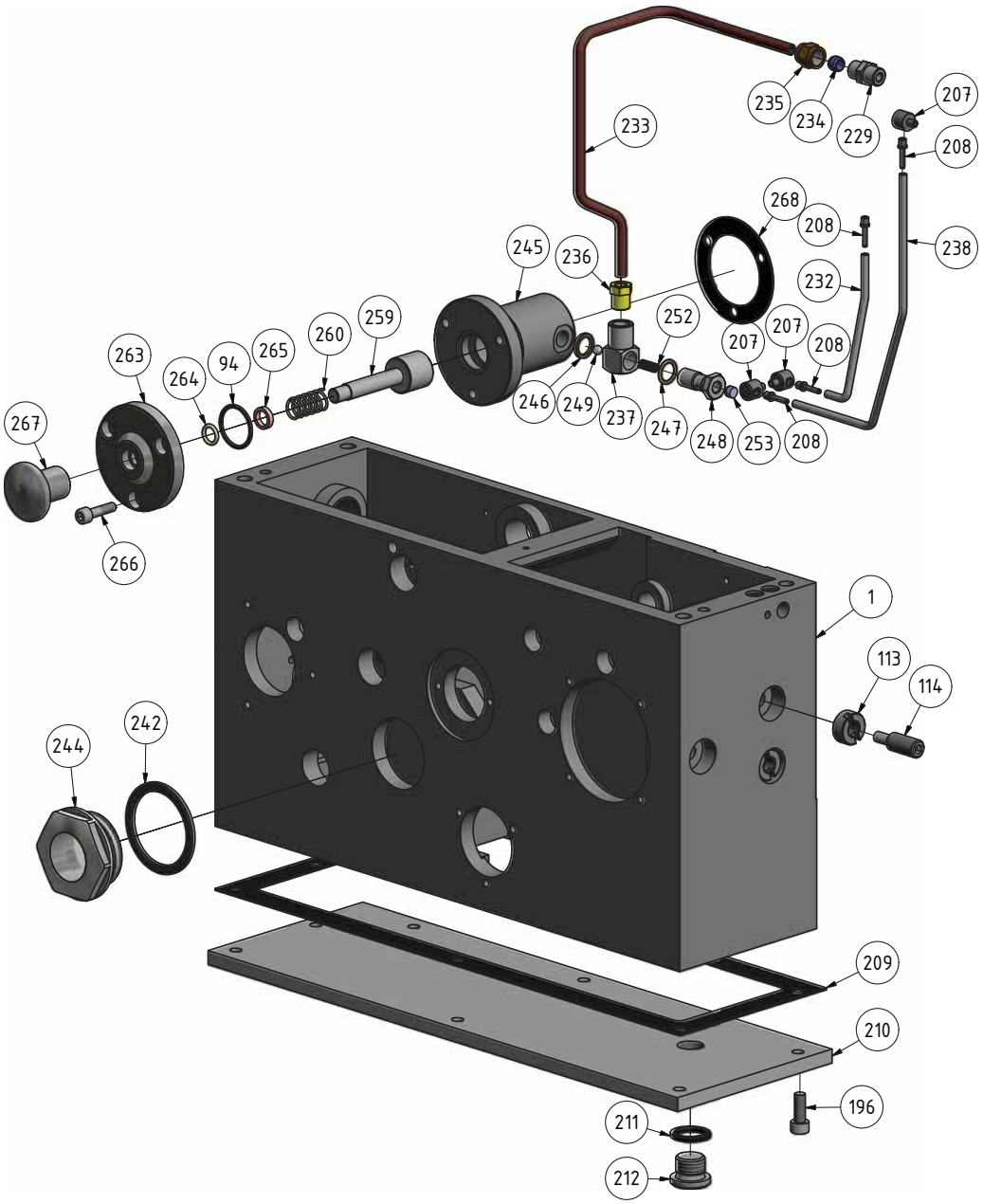
Z Schlosskasten - Apron



Ersatzteilliste Schlosskasten - Spare parts list apron					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Gehäuse	Housing	1		
2	Welle	Shaft	1		03432240402
3	Flansch	Flange	1		03432240403
4	O-Ring	O-Ring	1	32x1,9	
5	Nadellager	Needle bearing	2	BK 1812	
6	Ring	Ring	1		
7	Nadellager	Needle bearing	1	HK 2516	040HK2516
8	Zahnrad	Gear	1		03432240408
9	Passfeder	Fitting key	1	6x16	042P6616
10	Zahnrad	Gear	1		03432240410
11	Nadellager	Needle bearing	4	HK 2216	
12	Zahnrad	Gear	1		03432240412
13	Passfeder	Fitting key	1	6x10	042P6612
14	Zahnrad	Gear	1		03432240414
15	Zahnrad	Gear	1		03432240415
17	Passfeder	Fitting key	1	6x20	042P6620

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Ersatzteilliste Schlosskasten - Spare parts list apron					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
18	Zahnrad	Gear	1		03432240418
20	Sechskantmutter	Hexagon nut	2	M5	
21	Schraube	Screw	2	M5x10	
22	Nadellager	Needle bearing	1	HK 3012	
23	Flansch	Flange	1		03432240423
24	O-Ring	O-Ring	4	40x1,9	
25	Welle	Shaft	1		03432240425
26	Stahlkugel	Steel ball	4	10	042KU10
27	Zylinderstift	Cylindrical pin	1	10x32	
28	Feder	Spring	1		03432240428
31	Gewindestift	Grub screw	1	M12x16	
32	Buchse	Bushing	1		03432240432
33	Ring	Ring	1		
34	Axiallager	Thrust bearing	1	INA-AXW 20	03432240434
35	Nadellager	Needle bearing	1	HK 1812	040BK1812
36	Radialwellendichtring	Seal	1	TC18x24x3	
37	Zahnrad	Gear	1		03432240437
38	Scheibe	Washer	1		03432240438
39	Stahlkugel	Steel ball	2	12	042KU12
40	Flansch	Flange	1		03432240440
41	Axiallager	Thrust bearing	1	AXK 2542	03432240441
42	Platte	Plate	1		03432240442
43	Passfeder	Fitting key	1	5x18	042P5518
44	Spannstift	Spring pin	3	3x24	
45	Innensechskantschraube	Socket head screw	14	M5x12	
47	Schnecke	Worm	1		03432240447
48	Ring	Ring	1		
49	Axiallager	Thrust bearing	2	51102	04051102
50	Führung	Guide	1		03432240450
51	Buchse	Bushing	1	1515-SF-1	03432240451
52	Nutmutter	Grooved nut	1	M14x1,5	
53	Bolzen	Bolt	1		
54	Platte	Plate	1		03432240454
55	Sicherungsring	Retaining ring	5	6	
56	Bolzen	Bolt	1		03432240456
57	Schaltklaue	Switch cam	1		03432240457
58	Buchse	Bushing	4	1412-SF-1	
59	Schaltklaue	Switch cam	1		03432240459
60	Zylinderstift	Cylindrical pin	2	5x40	
61	Feder	Spring	1		03432240461
63	Platte	Plate	1		03432240463
64	Innensechskantschraube	Socket head screw	1	M4x8	
66	Zylinderstift	Cylindrical pin	2	6x32	
67	Stange	Rod	1		03432240467
68	Sechskantmutter	Hexagon nut	4	M6	
69	Block	Block	1		03432240469
70	Platte	Plate	1		03432240470
71	Platte	Plate	2		
72	Sechskantschraube	Socket head screw	2	M5x12	
73	Sechskantmutter	Hexagon nut	1	M8x25	
74	Sechskantmutter	Hexagon nut	1	M8	
75	Block	Block	1		03432240475
76	Stift	Pin	1		
77	Kupplung	Clutch	2		03432240477
78	Buchse	Bushing	2		
79	Stift	Pin	1		
80	Flansch	Flange	2		03432240480
81	O-Ring	O-Ring	9	14x1,9	
82	Innensechskantschraube	Socket head screw	2	M5x10	
83	Welle	Shaft	1		03432240483
84	Buchse	Bushing	1		
85	Gewindestift	Grub screw	1	M5x5	
87	Stopfen	Plug	3		03432240487
88	Welle	Shaft	2		03432240488
89	Stahlkugel	Steel ball	12	6	042KU06
90	Stahlkugel	Steel ball	7	4	042KU03
91	Gewindestift	Grub screw	5	M5x5	
92	Schaltklaue	Switch cam	1		03432240492
93	Welle	Shaft	1		03432240493
94	O-Ring	O-Ring	2	25x1,9	
95	Scheibe	Washer	5	10	
96	Feder	Spring	1		03432240496

Ersatzteilliste Schlosskasten - Spare parts list apron					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
97	Scheibe	Washer	1	8	
98	Sicherungsring	Retaining ring	1	4	
99	Exzenter	Eccentric	1		03432240499
100	Flansch	Flange	1		034322404100
101	Buchse	Bushing	1		034322404101
102	Passfeder	Fitting key	2	5x20	042P5520
103	Zylinderstift	Cylindrical pin	1	6x30	
104	Drehscheibe	Mode washer	1		034322404104
105	Kugellager	Ball bearing	1	16008	034322404105
106	Zylinderstift	Cylindrical pin	1	6x20	
110	Gewindestift	Grub screw	2	M8x8	
111	Sicherungsring	Retaining ring	1	30	042SR30W
112	Radialwellendichtring	Seal	1	TC50x68x8	
113	Buchse	Bushing	3		034322404113
114	Buchse	Bushing	2		034322404114
115	Flansch	Flange	1		034322404115
116	Radialwellendichtring	Seal	1	TC45x52x4	
117	Nadellager	Needle bearing	1	HK 4512	040HK4512
119	O-Ring	O-Ring	1	65x2,65	
120	Welle	Shaft	1		034322404120
121	Nabe	Collet	1		034322404121
122	Hülse	Sleeve	1		034322404122
123	O-Ring	O-Ring	1	40	
124	Buchse	Bushing	1		034322404124
125	Nabe	Collet	1		034322404125
126	Innensechskantschraube	Socket head screw	3	M3x20	
127	Hebel	Lever	1		034322404127
128	Knopf	Knob	2		034322404128
129	Stößel	Rod	1		034322404129
130	O-Ring	O-Ring	1	16x1,9	
131	Stift	Pin	1		
132	Stift	Pin	1		
133	Feder	Spring	1		034322404133
137	Schaltklaue	Switch cam	1		034322404137
138	Welle	Shaft	1		034322404138
139	Zahnrad	Gear	1		034322404139
140	Zahnrad	Gear	1		034322404140
141	Innensechskantschraube	Socket head screw	6	M6x12	
142	Nadellager	Needle bearing	5	BK 1512	
162	Stahlkugel	Steel ball	2	6,35	042KU63
163	Gewindestift	Grub screw	1	M5x12	
164	Welle	Shaft	2		034322404164
165	Buchse	Bushing	1	1420-SF-1	034322404165
166	Zahnrad	Gear	1		034322404166
167	Zahnrad	Gear	1		034322404167
168	Niet	Rivet	4	3x20	
169	Passscheibe	Shim ring	1	DIN988-14x20x0.5	
170	Scheibe	Washer	1	14	
171	Gehäuse	Housing	1		034322404171
172	Zahnrad	Gear	1		034322404172
173	Zahnwelle	Gear shaft	1		034322404173
174	Passscheibe	Shim ring	2	DIN988-26x37x2	
175	Buchse	Bushing	2		
176	Radialwellendichtring	Seal	2	TC26x37x7	
177	Gewindestift	Grub screw	2	M6x16	
178	Zahnwelle	Gear shaft	1		034322404178
179	Passscheibe	Shim ring	1	DIN988-22x32x1	
180	Radialwellendichtring	Seal	3	22x28x4	
181	Buchse	Bushing	1		
182	Welle	Shaft	1		034322404182
183	Zahnrad	Gear	1		034322404183
184	Gewindestift	Grub screw	2	M4x12	
185	Sechskantmutter	Hexagon nut	2	M4	
186	Verschluss	Plug	1		034322404186
187	Schraube	Screa	2	M6x10	
188	Zylinderstift	Cylindrical pin	2	6x40	
189	Innensechskantschraube	Socket head screw	6	M6x50	
190	Platte	Plate	1		034322404190
191	Stift	Pin	1		034322404191
195	Buchse	Bushing	2	2415-SF-1	034322404195
196	Innensechskantschraube	Socket head screw	9	M6x16	
197	Innensechskantschraube	Socket head screw	2	M6x20	

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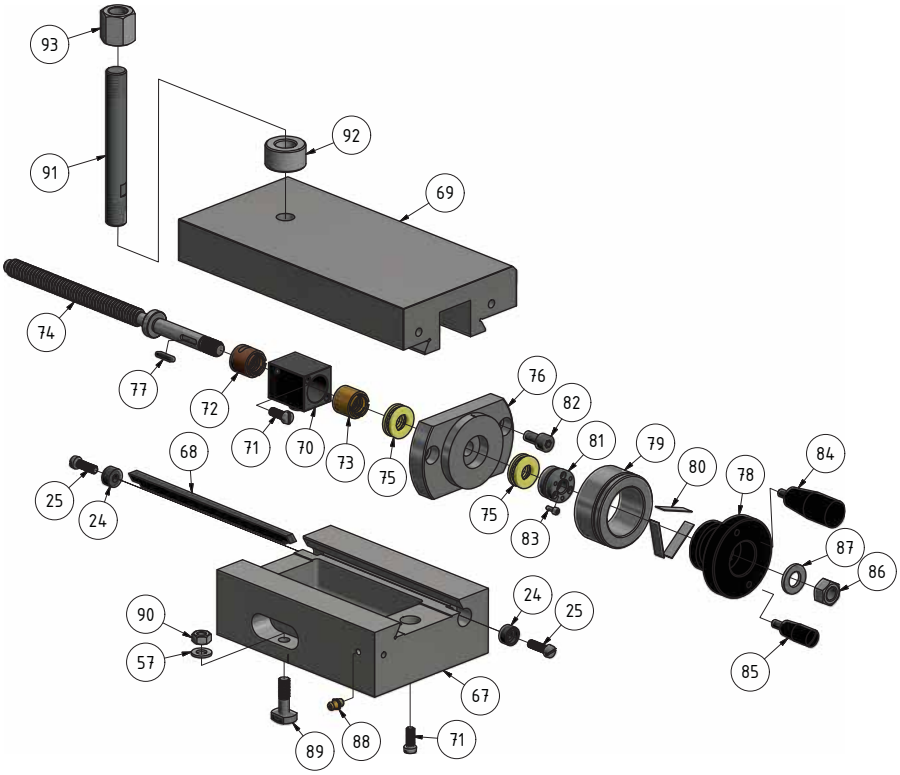
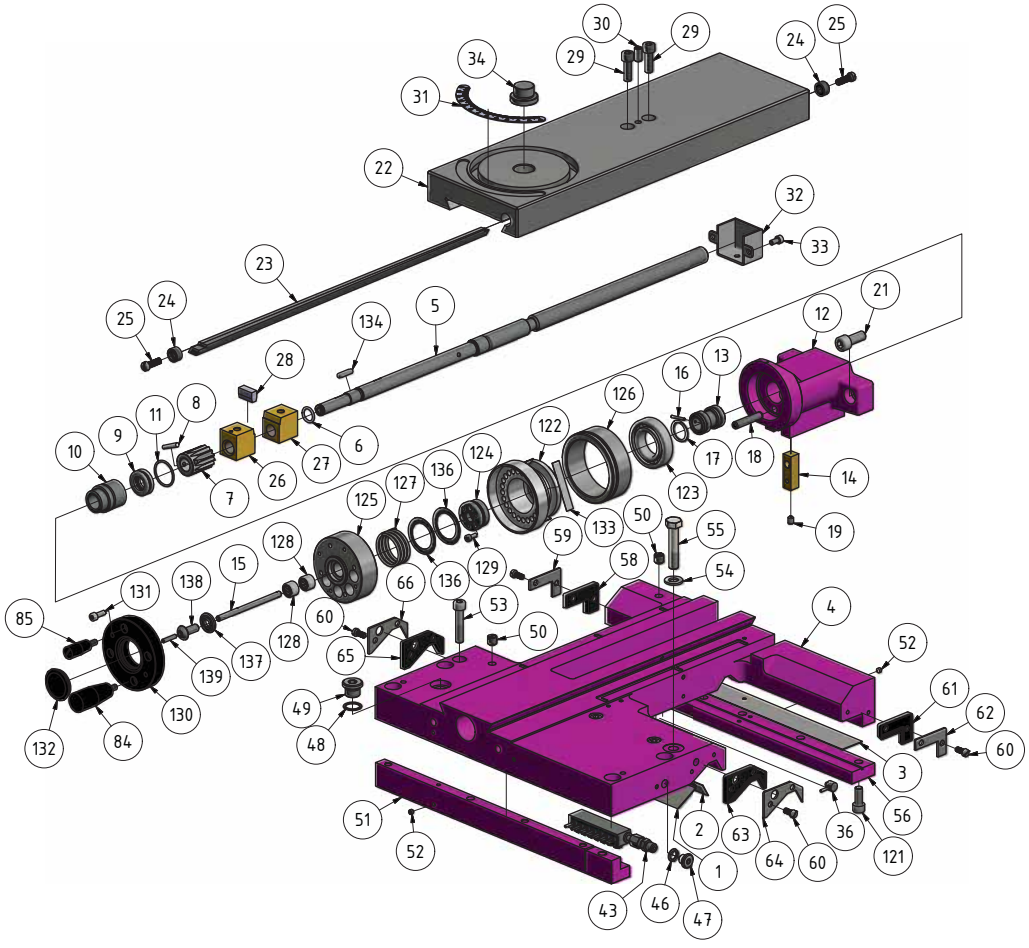
Ersatzteilliste Schlosskasten - Spare parts list apron					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
198	Zylinderstift	Cylindrical pin	2	6x20	
200	Schlossmutter	Lock nut	1		034322404200
202	Gewindestift	Grub screw	1	M12x45	
203	Sechskantmutter	Hexagon nut	1	M12	
205	Abdeckung	Cover	1		034322404205
206	Schraube	Screw	4	M6x10	
207	Anschluss	Plug	4		
208	Adapter	Adapter	4		
209	Dichtung	Seal	1		034322404209
210	Deckel	Cover	1		
211	Dichtring	Seal	1	16	
212	Ablassschraube	Plug screw	1	M16x1.5	
213	Welle	Shaft	1		034322404213
214	Zahnrad	Gear	1		034322404214
215	Flansch	Flange	1		034322404215
216	Hülse	Sleeve	1		034322404216
217	Nabe	Collet	1		034322404217
218	Gewindestift	Grub screw	2	M10x14	
219	Gewindestift	Grub screw	2	M10x6	
220	Stift	Pin	3		
221	Stahlkugel	Steel ball	2	8	042KU08
222	Hebel	Lever	1		034322404222
223	Feder	Spring	1		034322404223
224	Passscheibe	Shim ring	2	DIN988-22x30x1	
225	Sicherungsring	Retaining ring	1	22	042SR22I
226	Innensechskantschraube	Socket head screw	4	M4x12	
229	Anschluss	Plug	1		
233	Ölleitung	Oil pipe	1		034322404233
234	Hülse	Sleeve	2		
235	Verschraubung	Crew connection	1		
236	Anschluss	Plug	1		034322404236
237	Anschluss	Plug	1		034322404237
238	Ölleitung	Oil pipe	1		
242	Dichtring	Seal	1	32	
244	Ölschauglas	Oil sight glass	1	A32	034322404244
245	Pumpengehäuse	Pump housing	1		034322404245
246	Dichtring	Seal	1		
247	Ring	Ring	1		
249	Stahlkugel	Steel ball	1	5	042KU05
252	Feder	Spring	1		
259	Stößel	Rod	1		034322404259
260	Feder	Spring	1		034322404260
263	Flansch	Flange	1		034322404263
264	O-Ring	O-Ring	1	12x1,9	
265	Ring	RIng	1		
266	Innensechskantschraube	Socket head screw	7	M5x20	
267	Knopf	Knopf	1		
268	Dichtung	Seal	1		034322404268
271	Buchse	Bushing	1		034322404271
272	Innensechskantschraube	Socket head screw	3	M5x40	
273	Zahnwelle	Gear shaft	1		034322404273
274	Kugellager	Ball bearing	1	6006-2RS	0406006R
275	Passscheibe	Shim ring	2	DIN988-30x42x0.2	
276	Buchse	Bushing	1		034322404276
277	Skalenring	Scale ring	1		034322404277
278	Federblech	Spring plate	3		034322404278
279	Buchse	Bushing	1		
280	Passscheibe	Shim ring	3	DIN988-20x28x0.2	
281	Sicherungsring	Retaining ring	1	20	042SR20W
282	Feder	Spring	1		034322404282
283	Flansch	Flange	1		034322404283
284	Nadellager	Needle bearing	2	HK 2012	
285	Handrad	Handle	1		034322404285
287	Stift	Pin	4		
288	Scheibe	Washer	1		
289	Schraube	Screw	1		
290	Gewindestift	Grub screw	1	M4x20	

AA Oberschlitten - Top slide



AB Planschlitten - Cross slide



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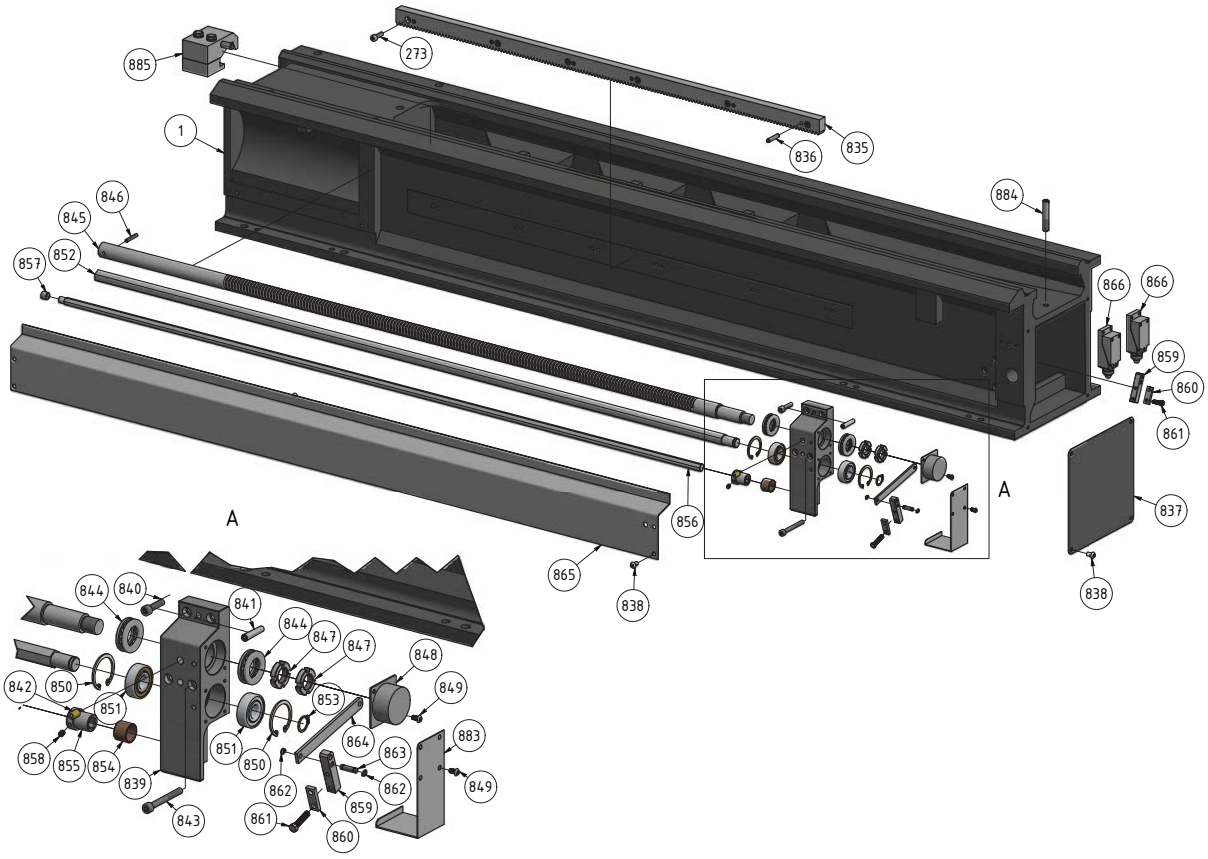
Ersatzteilliste Ober, Planschlitten - Spare parts list top slide, cross slide					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Platte	Plate	1		03432240601
2	Platte	Plate	1		03432240602
3	Platte	Plate	1		03432240603
4	Planschlittenführung	Cross slide guide	1		03432240604
5	Spindel	Spindle	1		03432240605
6	O-Ring	O-Ring	1	18x2.4	
7	Zahnrad	Gear	1		03432240607
8	Kegelstift	Taper stift	1	4x24	
9	Axiallager	Trust bearung	1	51102	04051102
10	Hülse	Sleeve	1		03432240610
11	O-Ring	O-Ring	1	1.8x26.5	
12	Lagerbock	Bearing block	1		03432240612
13	Hülse	Sleeve	1		03432240613
14	Platte	Plate	1		
15	Welle	Shaft	1		
16	Stift	Pin	1	2,5x20	
17	O-Ring	O-Ring	1	24x2.4	
18	Zylinderstift	Cylyndrical pin	1	8x40	
19	Gewindestift	Grub screw	2	M6x8	
21	Innensechskantschraube	Socket head screw	2	M10x25	
22	Planschlitten	Cross slide	1		03432240622
23	Keilleiste	Gib	1		03432240623
24	Buchse	Bushing	4		03432240624
25	Schraube	Screw	4	M6x20	
26	Spindelmutter	Spindle nut	1		03432240626
27	Spindelmutter	Spindle nut	1		03432240627
28	Platte	Plate	1		03432240628
29	Innensechskantschraube	Socket head screw	2	M8x25	
30	Gewindestift	Grub screw	1	M8x16	
31	Skala	Scala	1		03432240631
32	Abdeckung	Cover	1		03432240632
33	Schraube	Screw	2	M5x10	
34	Bolzen	Bolt	1		03432240634
43	Verteiler	Manifold	1		03432240643
46	Dichtung	Seal	1		
47	Verschlussschraube	Plug screw	1		
48	Dichtung	Seal	1		
49	Verschlussschraube	Plug screw	1	M16x1.5	
50	Gewindestift	Grub screw	2	M10x10	
51	Klemmleiste	Gib	1		03432240651
52	Gewindestift	Grub screw	2	M5x5	
53	Innensechskantschraube	Socket head screw	3	M8x40	
54	Scheibe	Washer	1	10	
55	Sechskantschraube	Socket head screw	1	M10x50	
56	Klemmleiste	Gib	1		
57	Scheibe	Washer	8	8	
58	Abstreifer	Wiper	1		03432240658
59	Platte	Plate	1		03432240659
60	Schraube	Screw	8	M5x12	
61	Abstreifer	Wiper	1		03432240661
62	Platte	Plate	1		03432240662
63	Abstreifer	Wiper	1		03432240663
64	Platte	Plate	1		03432240664
65	Abstreifer	Wiper	1		03432240665
66	Platte	Plate	1		03432240666
67	Grundplatte	Base plate	1		03432240667
68	Keilleiste	Gib	1		03432240668
70	Spindelmuttergehäuse	Spindle nut housing	1		03432240670
71	Innensechskantschraube	Socket head screw	3	M6x16	
72	Spindelmutter	Spindle nut	1		03432240672
73	Spindelmutter	Spindle nut	1		03432240673
74	Spindel	Spindel	1		03432240674
75	Axiallager	Thrust bearing	2	51101	04051101
76	Lagerbock	Bearing block	1	C6140-07-10	03432240676
77	Passfeder	Fitting key	1	4x18	042P4418
78	Handrad	Handle	1		03432240678
79	Skalenring	Scale ring	1		03432240679
80	Federblech	Spring plate	3		03432240680
81	Buchse	Bushing	1		03432240681
82	Innensechskantschraube	Socket head screw	2	M8x16	
83	Innensechskantschraube	Socket head screw	3	M3x8	
84	Handhebel	Handle	2		03432240684

Ersatzteilliste Ober, Planschlitten - Spare parts list top slide, cross slide					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
85	Handhebel	Handle	2		03432240685
86	Sechskantmutter	Hexagon nut	1	ISO 4032 - M12	
87	Scheibe	Washer	1	DIN 125 - A 13	
89	Schraube	Washer	2	M8x35	
90	Sechskantmutter	Hexagon nut	2	M8	
93	Sechskantmutter	Hexagon nut	1	M16	
121	Innensechskantschraube	Socket head screw	6	M8 x 20	
122	Wahlscheibe	Mode washer	1		034322406122
123	Kugellager	Ball bearing	1	6006-2RS	0406006R
124	Klemmutter	Clamping nut	1		034322406124
125	Lagerbock	Bearing block	1		034322406125
126	Skalenring	Scala ring	1		034322406126
127	Feder	Spring	1		034322406127
128	Nadellager	Nadle bearing	2	HK121610	
129	Schraube	Screw	3	M4x10	
130	Nabe	Collet	1		034322406130
131	Innensechskantschraube	Socket head screw	4	M5x14	
132	Verschluss	Plug	1		034322406132
133	Federblech	Spring plate	3		
134	Passfeder	Fitting key	1	5x20	042P5520
136	Ring	Ring	2		
137	Scheibe	Washer	1		
138	Schraube	Screw	1		
139	Gewindestift	Grub screw	1	M4x20	

AC Maschinenbett - Machine bed



Ersatzteilliste Maschinenbett - Spare parts list machine bed

Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
1	Maschinenbett	Machine bed	1		
273	Innensechskantschraube	Socket head scsrew	6	M6x20	
835	Zahnstange	Rack	1		034322408835
836	Zylinderstift	Cylindrical pin	1	6x30	
837	Abdeckung	Cover	1		
838	Schraube	Screw	4	M6x10	
839	Lagerbock	Bearing block	1		
840	Innensechskantschraube	Socket head scsrew	4	M6x25	
841	Kegelstift	Taper pin	2	6x32	
842	Schmiernippel	Lubrication cup	1	8	
843	Innensechskantschraube	Socket head scsrew	2	M6x55	
844	Axiallager	Thrust bearing	1	51104	04051104
845	Leitspindel	Lead screw	1		034322408845
846	Abscherstift	Shear pin	1		
847	Nutmutter	Groove nut	2	M16x1,5	
848	Abdeckung	Cover	1		
849	Innensechskantschraube	Socket head scsrew	6	M4x8	
850	Sicherungsring	Retaining ring	1	35	042SR35W
851	Kugellager	Ball bearing	2	6202-2Z	0406202ZZ
852	Zugspindel	Feed rod	1		034322408852
853	Sicherungsring	Retaining ring	1	15	042SR15W
855	Buchse	Bushing	1		
856	Schaltwelle	Switch rod	1		034322408856
858	Innensechskantschraube	Socket head scsrew	1	M5x6	
859	Platte	Plate	2		
860	Platte	Plate	2		
861	Sechskantschraube	Hexagon screw	4	M5x25	
862	Sicherungsring	Retaining ring	4	5	
863	Stift	Pin	2		
864	Schaltstange	Switch rod	1		034322408864
865	Abdeckung	Cover	1		
866	Positionsschalter Drehrichtung	Position switch	2		
883	Abdeckung	Cover	1		
884	Gewindebolzen	Bolt	1	M10x54	
885	Endanschlag	Limit stop	1		034322408885

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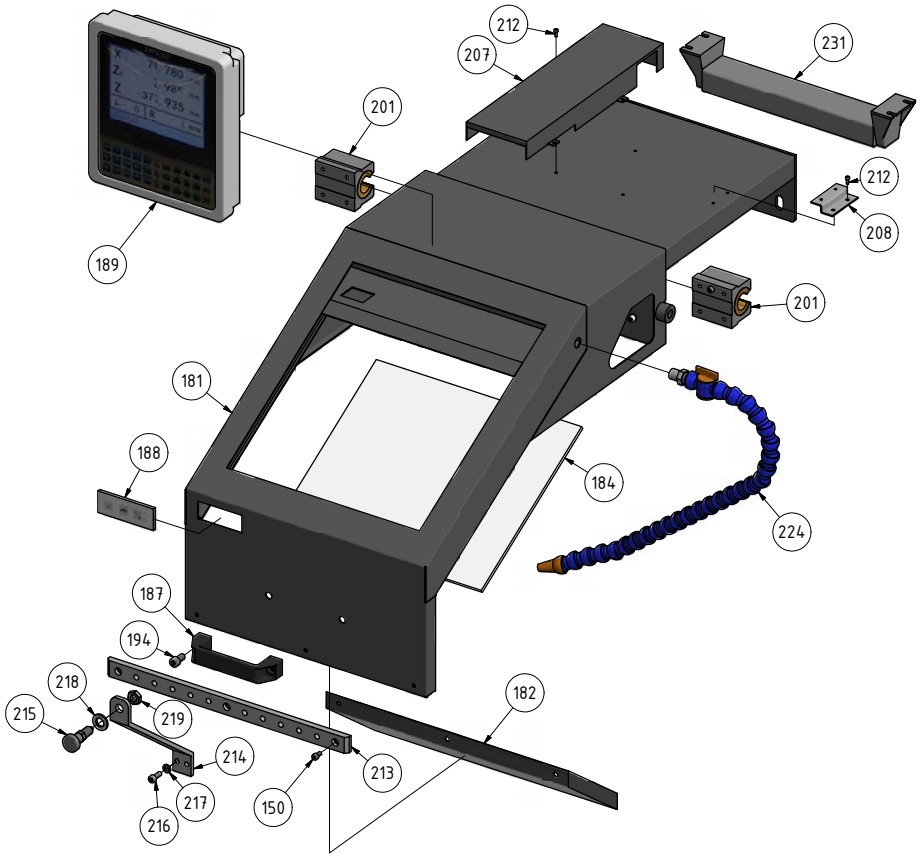
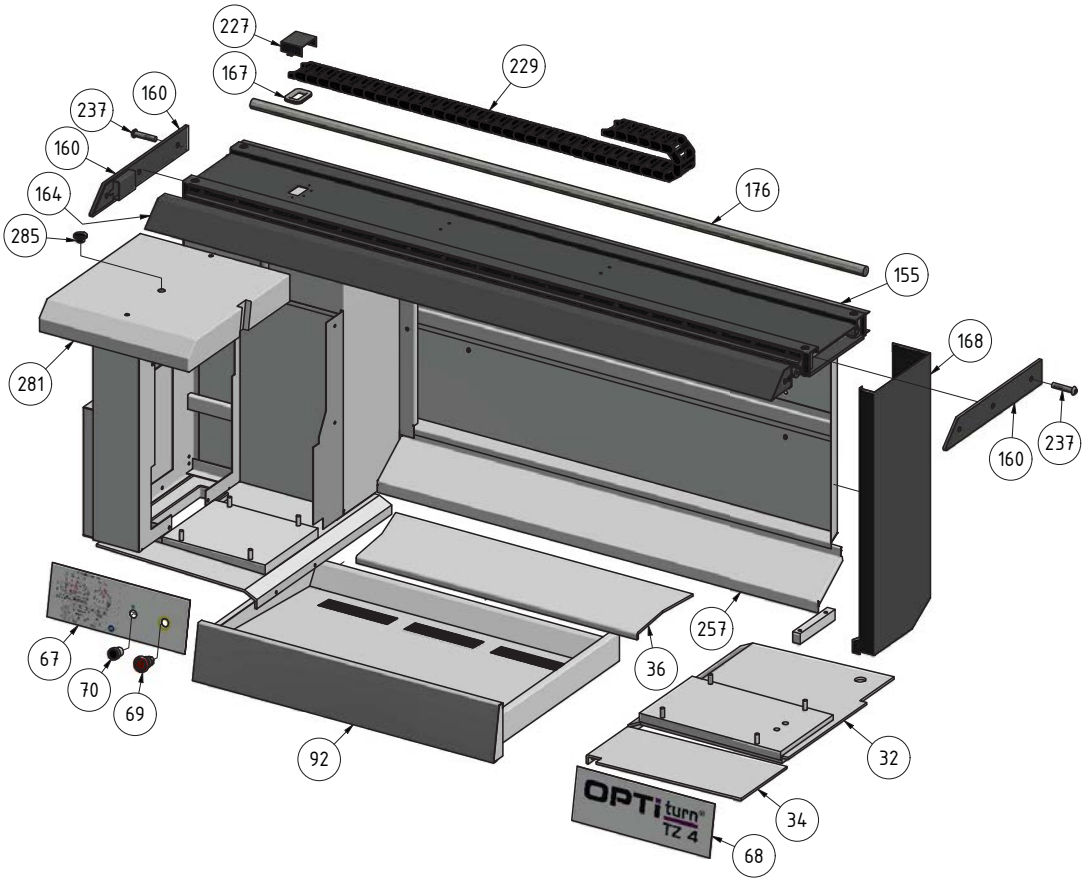
AD Gehäuse - Housing



AE Gehäuse - Housing



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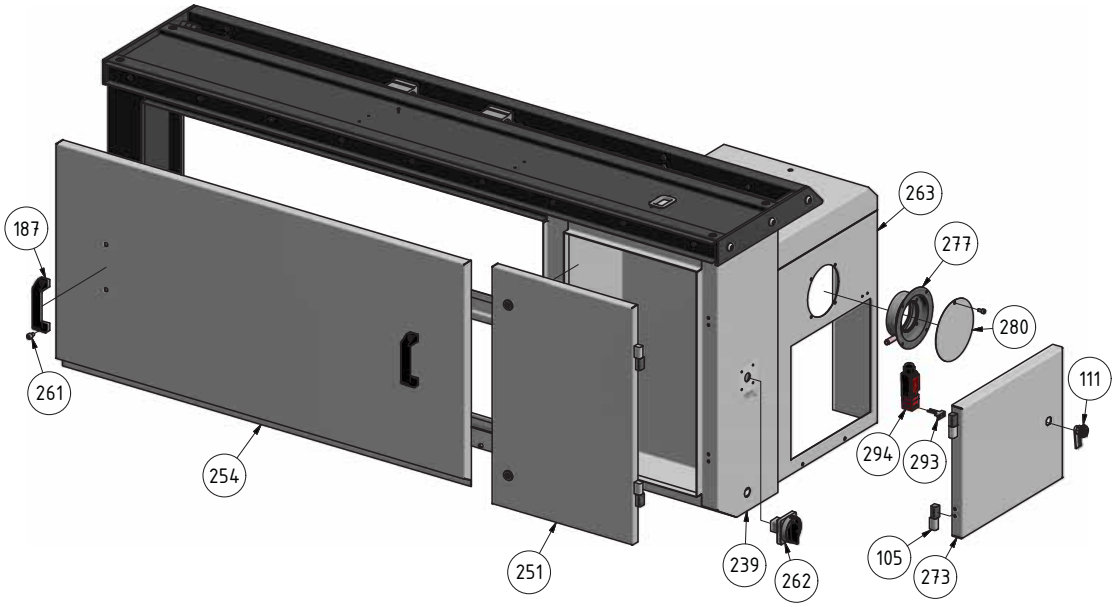
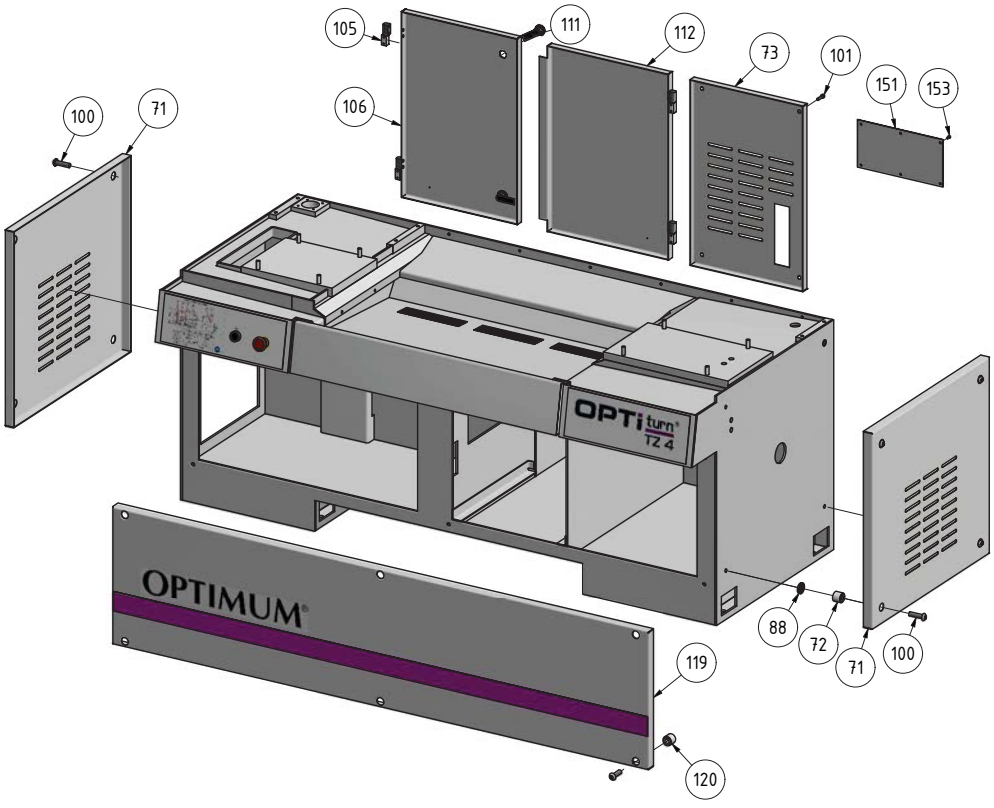
AF Gehäuse - Housing



AG Gehäuse - Housing



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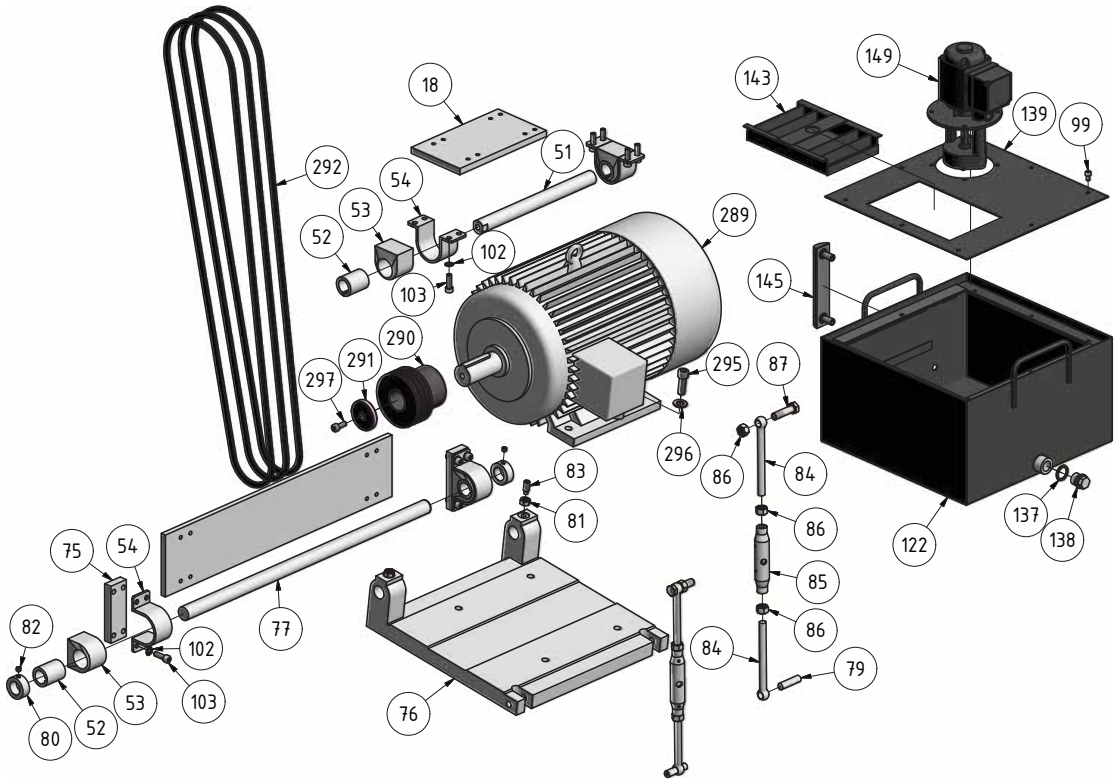
AH Antrieb - Drive



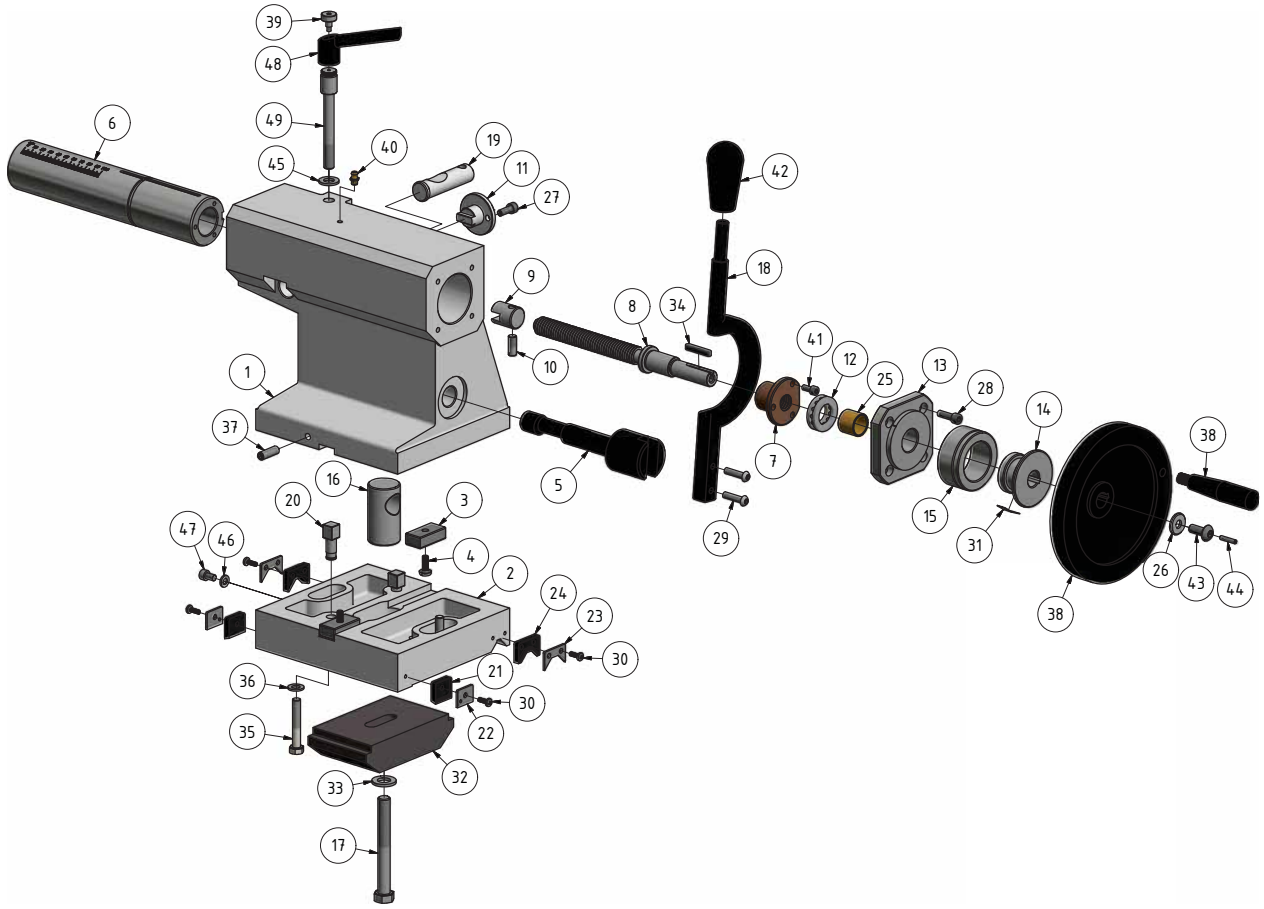
Ersatzteilliste Gehäuse und Antrieb - Spare parts list housing and drive					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
18	Platte	Plate	1		03432240818
32	Platte	Plate	1		03432240832
34	Platte	Plate	1		
36	Abdeckung	Cover	1		
51	Welle	Shaft	1		03432240851
52	Hülse	Sleeve	4		03432240852
53	Führung	Guide	4		03432240853
54	Halterung	Holder	4		03432240854
67	Blende	Cover	1	TZ4	03432240867
67	Blende	Cover	1	TZ4V	03432245867
68	Blende	Cover	1	TZ4	03432240868
68	Blende	Cover	1	TZ4V	03432245868
69	Not-Halt Taster	Emergency-stop button	1		03432240869
70	Momenttaster	Direct run button	1		03432240870
71	Abdeckung	Cover	2		03432240871
72	Buchse	Bushing	8		
73	Abdeckung	Cover	1		03432240873
75	Platte	Plate	2		03432240875
76	Motorplatte	Motor plate	1		03432240876
77	Welle	Shaft	1		03432240877
79	Bolzen	Bolt	1		
80	Buchse	Bushing	2		03432240880
81	Sechskantmutter	Hexagon nut	2	M10	
82	Gewindestift	Grub screw	2	M8x8	
83	Gewindestift	Grub screw	2	M10x25	
84	Stange	Rod	4		03432240884
85	Hülse	Sleeve	2		03432240885
86	Sechskantmutter	Hexagon nut	8	M12	
87	Bolzen	Bolt	2	M12x45	
88	Scheibe	Washer	8	30	
92	Spänewanne	Chip tray	1		03432240892
99	Innensechskantschraube	Socket head screw	16	M6x10	
100	Schraube	Screw	10	M12X45	
101	Schraube	Screw	4	M6x25	
102	Scheibe	Washer	16	8	
103	Schraube	Screw	16	M8x25	
105	Scharnier	Hinge	8		
106	Tür	Door	1		034322408106

TZ4_parts.fm

Ersatzteilliste Gehäuse und Antrieb - Spare parts list housing and drive					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
111	Schloss	Lock	5		
112	Tür	Door	1		034322408112
119	Frontabdeckung	Front cover	1		034322408119
122	Kühlmittelbehälter	Coolant tank	1		034322408122
137	Dichtring	Seal	1		
138	Ablassschraube	Plug screw	1		034322408138
139	Platte	Plate	1		034322408139
143	Sieb	Filter	1		034322408143
145	Kühlmittelanzeige	Coolant fluid indicator	1		049GN6501
149	Kühlmittelpumpe	Coolant pump	1		034322408149
150	Innensechskantschraube	Socket head screw	7	ISO 4762 - M5 x 10	
151	Abdeckung	Cover	1		034322408151
153	Innensechskantschraube	Socket head screw	6	ISO 4762 - M4 x 8	
155	Abdeckung	Cover	1		034322408155
160	Abdeckung	Cover	2		
164	Abdeckung	Cover	1		
167	Platte	Plate	1		034322408167
168	Abdeckung	Cover	1		034322408168
176	Führungsstange	Rod	1		034322408176
181	Schutzhaube	Safety cover	1		034322408181
182	Traufblech Späneschutz	Chip guard eaves plate	1	402x150mm	034322408182
184	Schutzglas	safety glas	1	350x290x5mm	034322408184
187	Handgriff	Handle	3		
188	Touchsteuerung	Touch control	1		
189	Digitalanzeige	Digital indicator	1	DPA31Plus for combination of ball measuring bar and magnetic tape only	
	Digitalanzeige	Digital indicator	1	DPA32	03403027DPA32
	Aktiver Lesekopf Magnetband X und Z_0 Achse	Active read head Magnetic tape X and Z_0 axis	2		3384035
	TZ4, TZ4V Kugelmessleiste MSS31 Z-Achse	TZ4, TZ4V Ball measuring bar MSS31 Z axis	1		
	Magnetband X und Z_0 Achse	Magnetic tape X and Z_0 axis	1100mm		3383978
194	Innensechskantschraube	Socket head screw	2	ISO 4762 - M8 x 16	
201	Führung	Guide	2		034322408201
207	Abdeckung	Cover	1		034322408207
208	Halterung	Holder	1		
212	Innensechskantschraube	Socket head screw	7	ISO 4762 - M3 x 8	
213	Lochplatte	Perforated plate	1		034322408213
214	Winkel	Angle	1		034322408214
215	Bolzen	Bolt	1		
216	Innensechskantschraube	Socket head screw	2	M6x16	
217	Scheibe	Washer	2	6	
218	Scheibe	Washer	1	12	
219	Sechskantschraube	Hexagon screw	1	12	
224	Kühlmittelschlauch	Coolant hose	1		
227	Abdeckung	Cover	1		034322408227
229	Energiekette	Energy chain	1		034322408229
231	Maschinenlampe	Machine lamp	1	PGB-350-12W	034621101212
237	Schraube	Screw	4	M12x60	
239	Schaltschrank	Switch cabinet	1		
251	Schaltschranktür	Switch cabinet door	1		034322408251
254	Rückwand	Back wall	1		034322408254
257	Abdeckung	Cover	1		
261	Innensechskantschraube	Socket head screw	4	ISO 4762 - M8 x 12	
262	Hauptschalter	Main switch	1		034322408262
263	Abdeckung	Cover	1		
273	Abdeckung	Cover	1		034322408273
277	Wassersamler	Water collectror	1		034322408277
280	Abdeckung	Cover	1		
281	Abdeckung Spindelstock	Cover headstock	1		034322408281
285	Einfüllschraube	Plug screw	1		
289	Motor	Motor	1		034322408289
290	Riemenscheibe	Pulley	1		034322408290
291	Scheibe	Washer	1		034322408291
292	Antriebsriemen	Drive belt	3	3V750	039XPZ1900
293	Platte Sicherheitsschalter	Safety switch plate	1		
294	Sicherheitsschalter	Safety switch	1		034322408294
295	Innensechskantschraube	Socket head screw	4	M12x35	
296	Scheibe	Washer	4	12	

Ersatzteilliste Gehäuse und Antrieb - Spare parts list housing and drive					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
297	Innensechskantschraube	Socket head screw	1	M8x20	

AI Reitstock - Tailstock



Ersatzteilliste Reitstock - Spare parts list tailstock					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Gehäuse	Housing	1		03432240901
2	Grundplatte	Base plate	1		03432240902
3	Block	Block	2		03432240903
4	Schraube	Screw	2	M6x16	
5	Exzenter	Eccentric	1		03432240905
6	Pinole	Sleeve	1		03432240906
7	Flansch	Flange	1		03432240907
8	Spindel	Spindle	1		03432240908
9	Gabel	Fork	1		03432240909
10	Bolzen	Bolt	1	M6X10	
11	Führung	Guide	1		03432240911
12	Axiallager	Thrust bearing	1	81104	
13	Lagerbock	Bearing block	1		03432240913
14	Buchse	Bushing	1		03432240914
15	Skalenring	Scale ring	1		03432240915
16	Klemmbolzen	Clamping bolt	1		03432240916
17	Sechskantschraube	Hexagon screw	1	M12x100	
18	Klemmhebel	Clamping lever	1		03432240918
19	Klemmbolzen	Clamping bolt	1		03432240919
20	Bolzen	Bolt	2		03432240920
21	Abstreifer	Wiper	2		03432240921
22	Platte	Plate	2		03432240922
23	Platte	Plate	2		03432240923
24	Abstreifer	Wiper	2		03432240924

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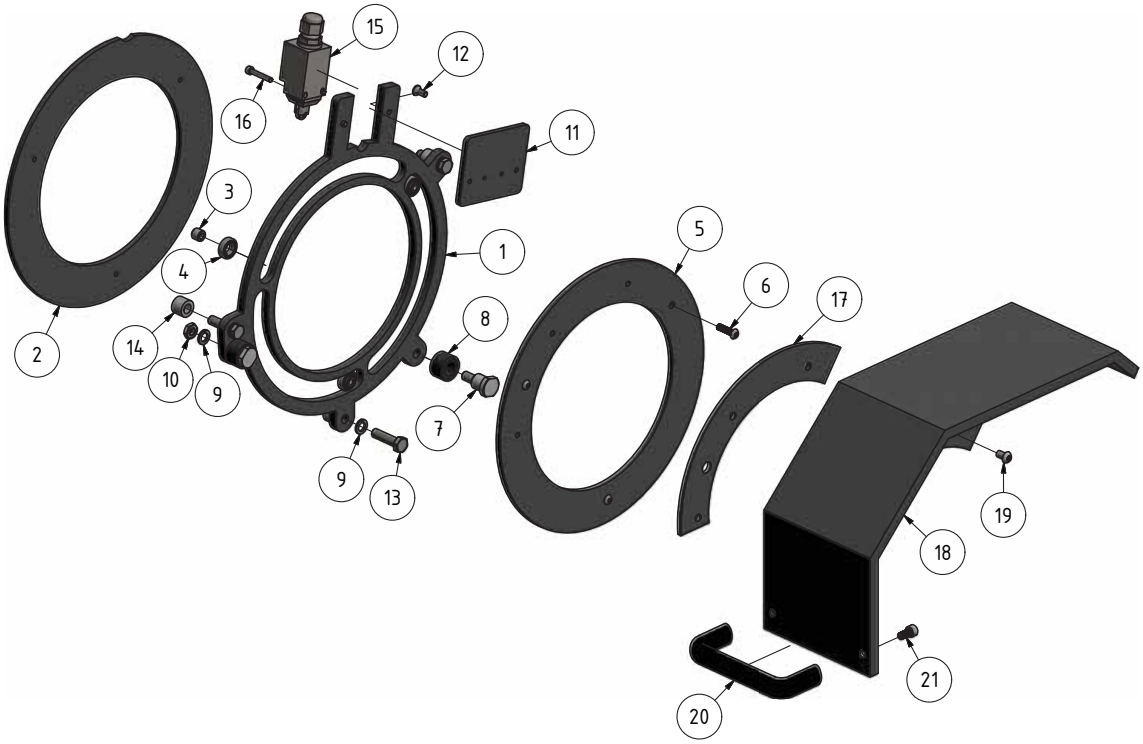
Ersatzteilliste Reitstock - Spare parts list tailstock					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
25	Buchse	Bushing	1		03432240925
26	Scheibe	Washer	1		
27	Schraube	Screw	2	M6x16	
28	Schraube	Screw	4	M6x20	
29	Schraube	Screw	2	M6x25	
30	Schraube	Screw	6	M4x12	
31	Federblech	Spring plate	1		
32	Klemmplatte	Clamping plate	1		03432240932
33	Scheibe	Washer	1	12	
34	Passfeder	Fitting key	1	5x32	042P5530
35	Sechskantschraube	Hexagon screw	2	M8x50	
36	Scheibe	Washer	2	8	
37	Gewindestift	Grub screw	2	M8x25	
38	Handrad	Handle	1		03432240938
39	Schraube	Screw	1		
40	Schmiernippel	Lubrication cup	1	M6	0340105
41	Schraube	Screw	3	M5x12	
42	Knopf	Knob	1		
43	Schraube	Screw	1		03432240943
44	Gewindestift	Grub screw	1	M4x20	
45	Scheibe	Washer	1	10	
46	Scheibe	Washer	1	6	
47	Schraube	Screw	1	M6X10	
48	Klemmhebel	Clamping lever	1		03432240948
49	Welle	Shaft	1		03432240949

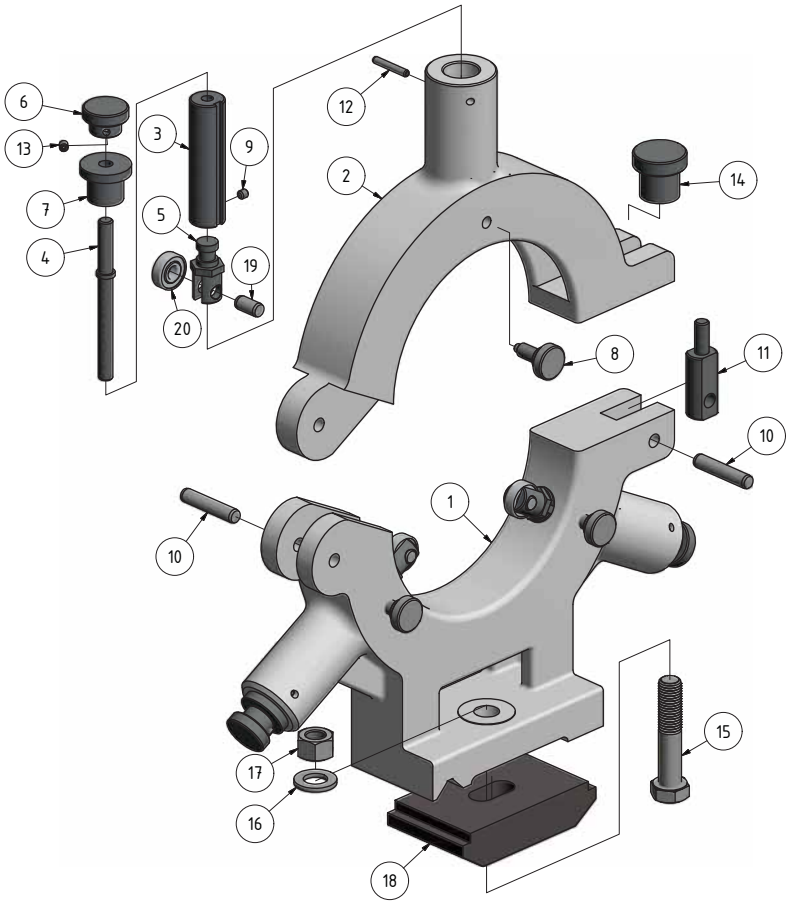
AJ Drehfutterschutz - Lathe chuck protection



Ersatzteilliste Drehfutterschutz - Spare parts list lathe chuck protection					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Mittelring	Middle ring	1		
2	Ring links	Ring left	1		
3	Buchse	Bushing	3		
4	Kugellager	Ball bearing	3	6800ZZ	0406800ZZ
5	Ring rechts	Ring right	1		
6	Schraube	Screw	3	M5x20	
7	Bolzen	Bolt	2		

Ersatzteilliste Drehfutterschutz - Spare parts list lathe chuck protection					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
8	Hülse	Sleeve	2		
9	Federscheibe	Spring washer	5	8	
10	Sechskantmutter	Hexagon nut	2	M8	
11	Platte	Plate	1		
12	Schraube	Screw	2	M5x10	
13	Sechskantschraube	Hexagon screw	3		
14	Abstandshülse	Sleeve	3		
15	Endschalter	End switch	1		
16	Innensechskantschraube	Socket head screw	2		
17	Platte	Plate	1		
18	Drehfutterschutz	Lathe chuck cover	1	komplett / complete	034322041118CPL
19	Schraube	Screw	3	M6x10	
20	Griff	Handle	1		
21	Innensechskantschraube	Socket head screw	2	M6x12	

AK Feststehende Lünette - Steady rest



Feststehende Lünette - Steady rest					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Festehende Lünette kpl	Steady rest complete	1		034322402001CPL
2	Gehäuse Oberteil	Housing top part	1		
3	Hülse	Sleeve	3		
4	Spindel	Spindle	3		
5	Gabel	Fork	3		
6	Knopf	Knob	3		
7	Buchse	Bushing	3		
8	Rändelschraube	Knurled screw	3		
9	Gewindestift	Grub screw	3	M6x6	
10	Zylinderstift	Cylindrical pin	2	10x50	
11	Bolzen	Bolt	1		
12	Spannstift	Spring pin	3	5x32	
13	Gewindestift	Grub screw	3	M6x8	

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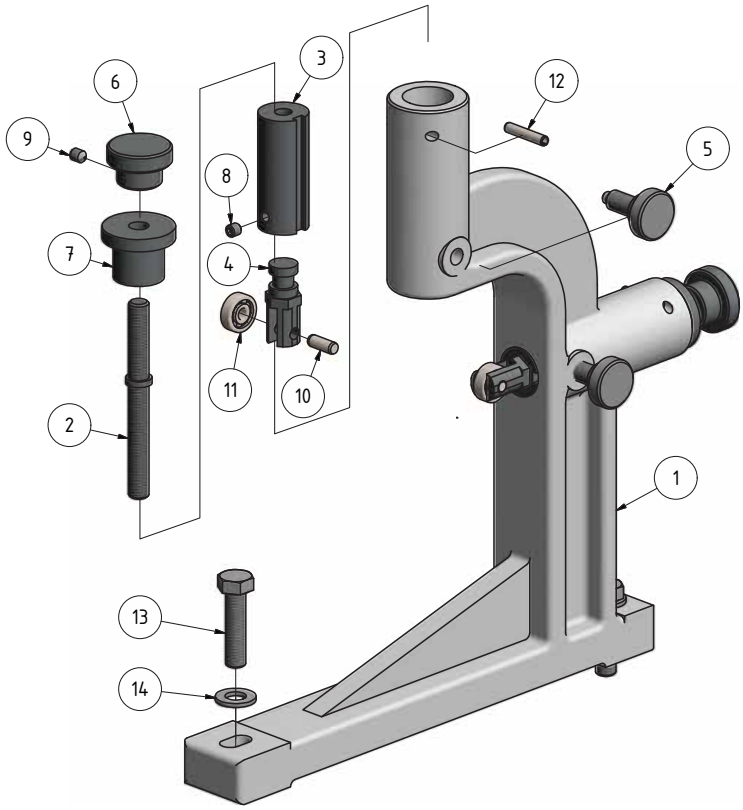
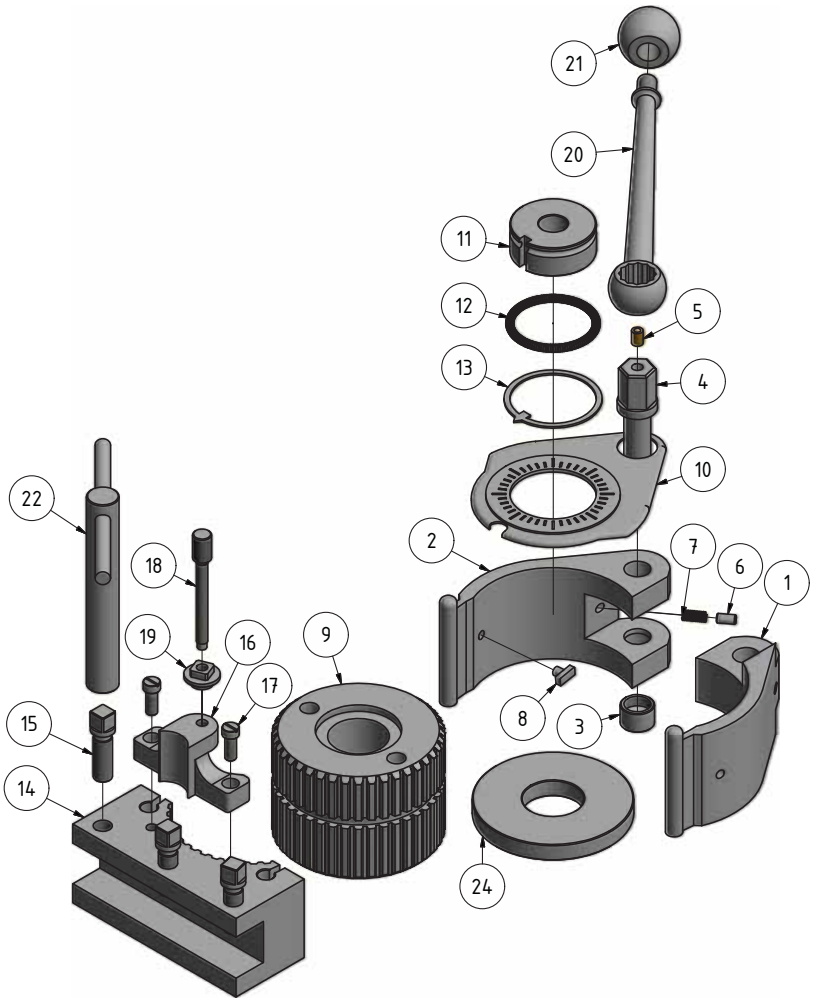
Feststehende Lünette - Steady rest					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
14	Rändelschraube	Knurled screw	1		
15	Sechskantschraube	Hexagon screw	1	M16x80	
16	Scheibe	Washer	1	16	
17	Sechskantmutter	Hexagon nut	1	M16x80	
18	Klemmplatte	Clamping plate	1		
19	Zylinderstift	Cylindrical pin	3	10x20	
20	Kugellager	Ball bearing	3	6000-2RZ	

AL Mitlaufende Lünette - Follow rest



Mitlaufende Lünette - Follow rest					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Mitlaufende Lünette kpl	Follow rest cpl	1		034322401001CPL
2	Spindel	Spindle	2		
3	Führungsbuchse	Guide bushing	2		
4	Gabel	Fork	2		
5	Rädelschraube	Knurled screw	2		
6	Knopf	Knob	2		
7	Hülse	Sleeve	2		
8	Gewindestift	Grub screw	1	M6x6	
9	Gewindestift	Grub screw	2	M6x8	
10	Zylinderstift	Cylindrical pin	2	6x16	
11	Kugellager	Ball bearing	2	626-2RZ	
12	Spannstift	Spring pin	2	5x26	
13	Sechskantschraube	Hexagon screw	2	M10x40	
14	Scheibe	Washer	2	10	

AM Schnellwechselhalter - Quick action tool holder

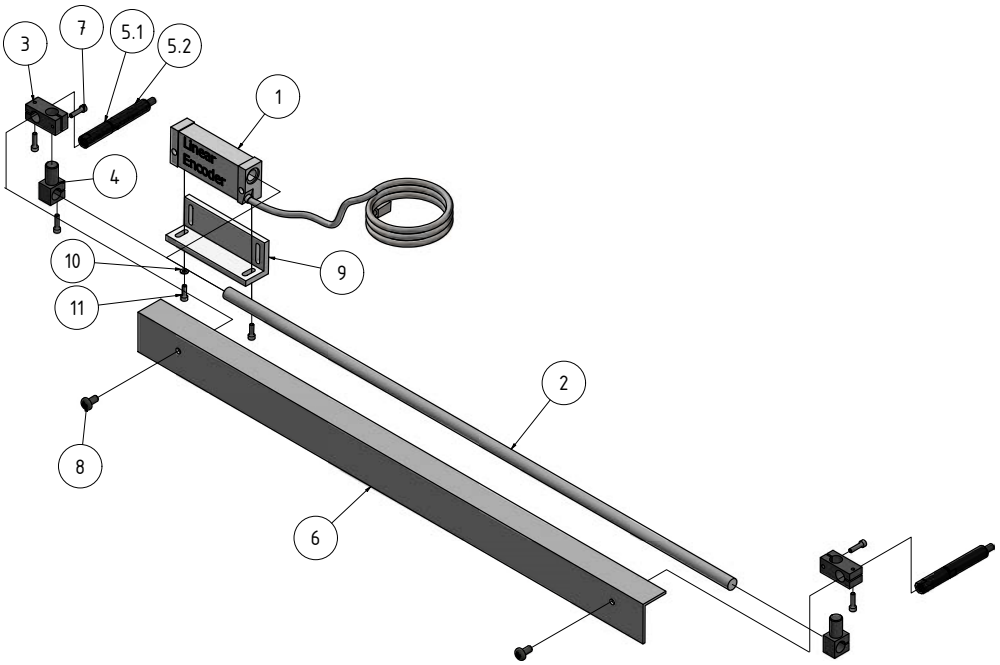


Schnellwechselhalter - Quick action tool holder					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1	Schnellwechselaufnahme A	Quick- action collet A	1		0338430501
2	Schnellwechselaufnahme B	Quick- action collet B	1		
3	Gewindebuchse	Threaded bushing	1		0338430503
4	Spannschraube	Clamp screw	1		0338430504
5	Schmiernippel	Lubrication cup	1		
6	Bolzen	Bolt	1		0338430506
7	Feder	Spring	1		0338430507
8	Nutenstein	Slot nut	3		
9	Zahnkranz	Crown gear	1		0338430509
10	Anzeigeskala	Indicator scale	1		0338430510
11	Zentrierscheibe	Centering washer	1		0338430511
12	Ring	Ring	1		0338430512
13	Zeiger	Indicator	1		0338430513
14	Stahlhalter Vierkantmeißel, Typ D	Holder square tool, Typ D	1	Zubehör / Accessory	3384306
15	Klemmschraube	Locking screw	3	M11x30	0338430515
16	Oberteil Höhenverstellung	Top adjustment of height	1		0338430516
17	Schraube	Screw	2		0338430517
18	Höhenverstellschraube	Screw adjustment of height	1		0338430518
19	Kontermutter	Counter nut	1		0338430519
20	Hebel	Lever	1		
21	Kugelknopf	Ball knob	1		
22	Schlüssel	Key	1		0338430522

TZ4_parts.fm

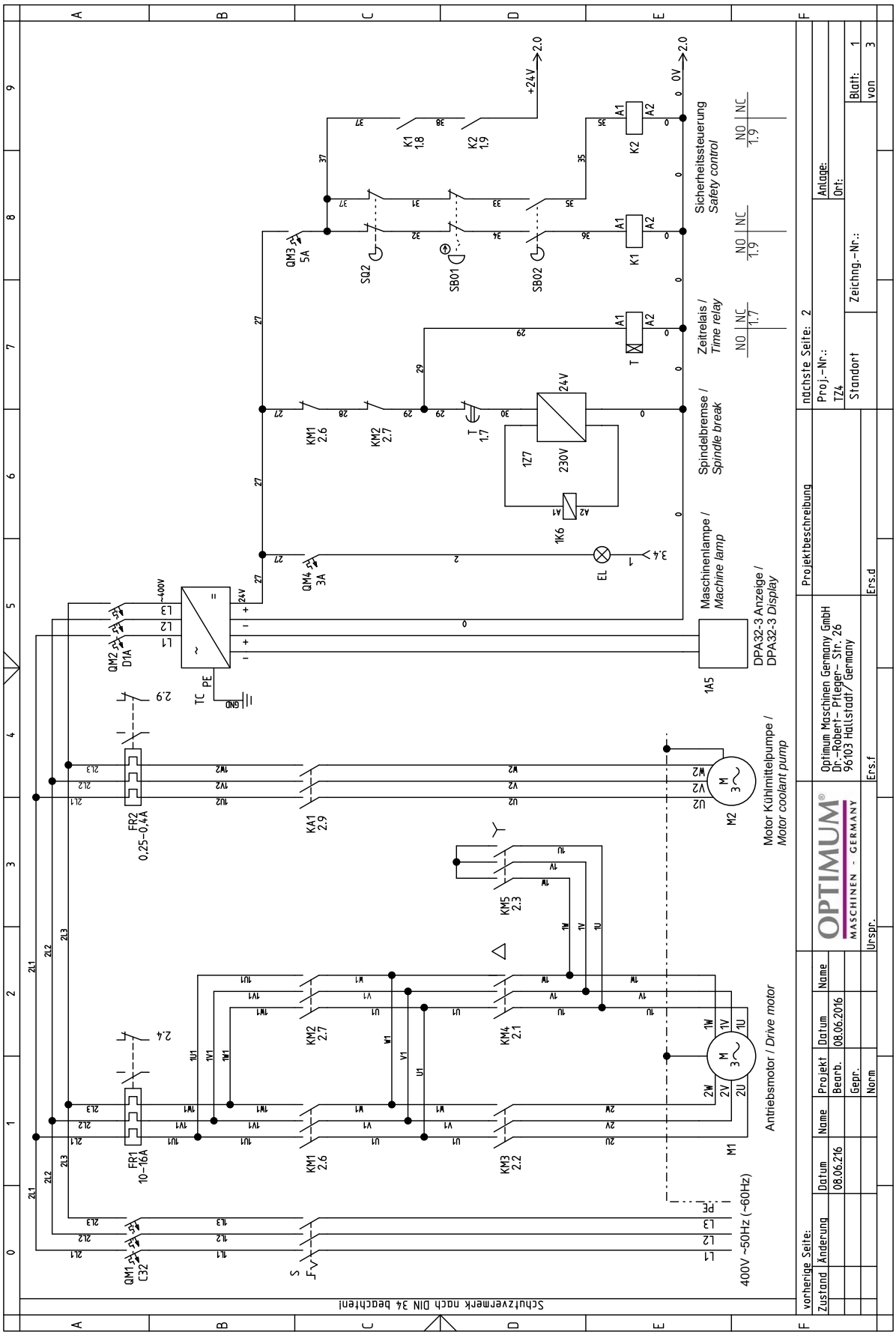
7.5 MSSR Linear Encoder - Ersatzteilzeichnungen - Spare part drawings

A Großer MSSR Messwandler - Large Linear encoder

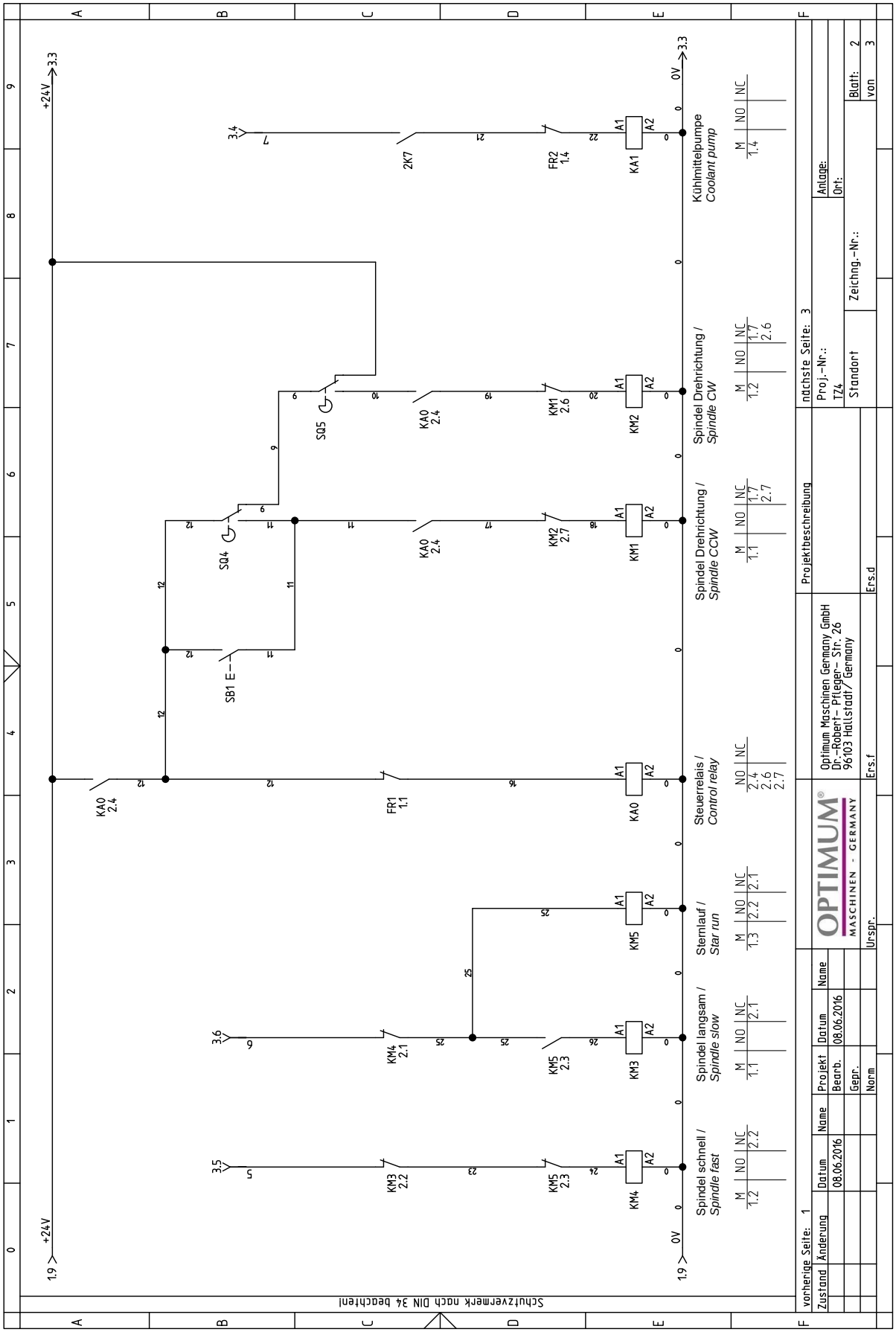


Teileliste - Parts list					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
01	Lesekopf	Reading head	1		0338440501
02	Kugelmessleiste	Ball measuring bar	1	verschiedene Längen different lengths	
03	Anschlussblock zur Aufnahme von Maßstab und Vorrichtung	Connection block for holding scale and fixture	2		0338440503
04	Fester Block für Maßstab und Halterung	Fixed block for scale and holder	2		0338440504
05.1	Installationssäule für Maßstab (vorne)	Installation column for scale (front)	2		0338440505-1
05.2	Installationssäule für Maßstab (hinten)	Installation column for scale (rear)	2		0338440505-2
06	Abdeckplatte für Maßstab und Halterung	Cover plate for scale and holder	1	verschiedene Längen different lengths	
07	Schraube M5 x 20	Screw M5 x 20	6	DIN EN ISO 4762 M5 x 20	
08	Schraube M8 x 16	Screw M8 x 16	2	DIN EN ISO 7045 Z M8 x 16	
09	Winkelhalterung	Angle holder	1		0338440509
10	Beilegscheibe	Washer	2	DIN 988 S6	
11	Schraube M6 x 25	Screw M6 x 25	2	DIN EN ISO 4762 M6 x 25	

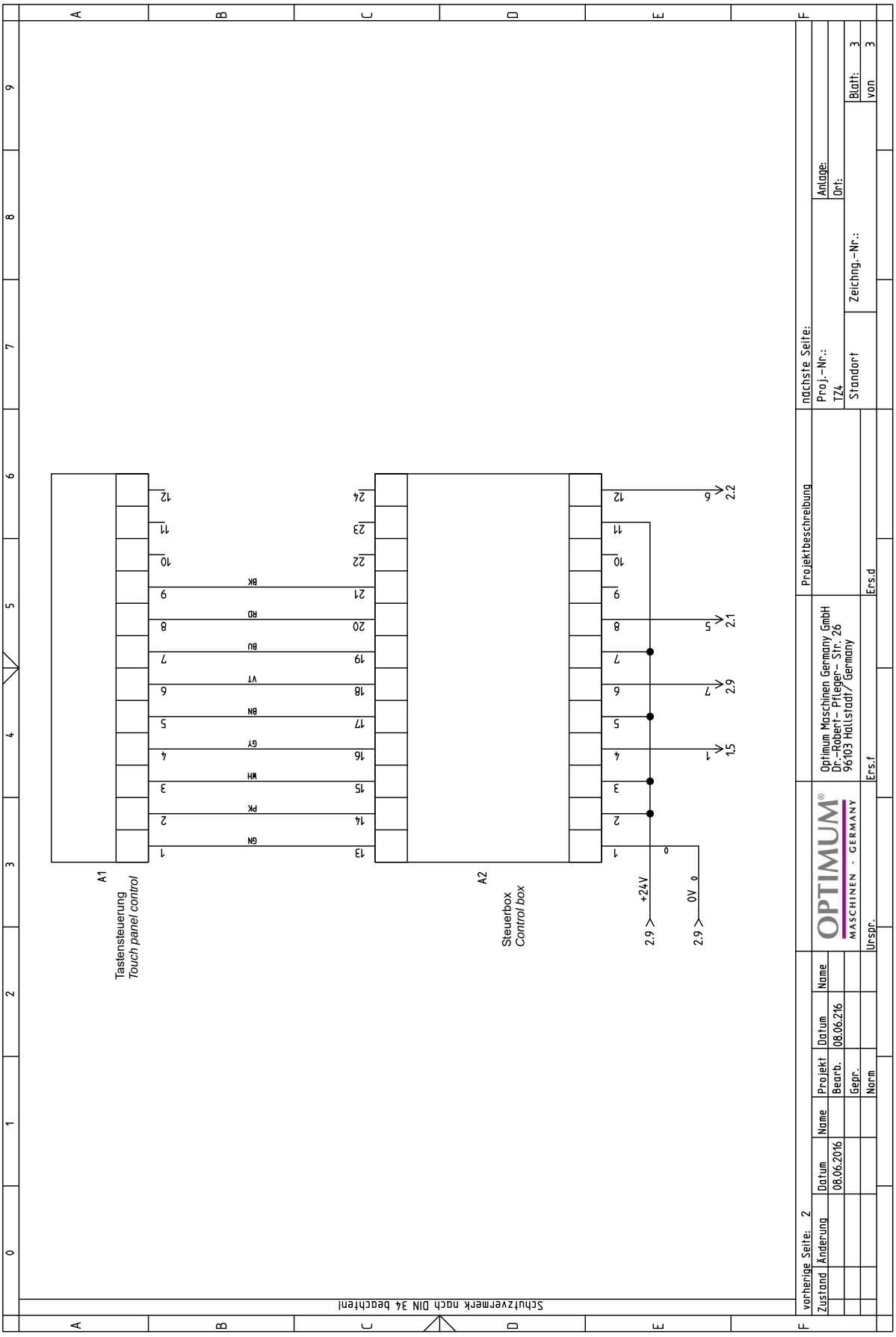
7.6 Schaltplan - Wiring diagram



TZ4_wiring-diagram.fm



TZ4_wiring-diagram.fm



TZ4_wiring-diagram.fm

TZ4 - Teileliste Elektrik - Electrical parts list					
Pos.	**Bezeichnung**	**Description**	**Menge Qty.**	**Grösse Size**	**Artikelnummer Item no.**
1A5	Digitale Positionsanzeige	Digital position display		DPA32-3	03403027DPA32
1K6	Elektromagnet Spindelbremse	Spindle bracket solenoid			034322401K6
1Z7	Spannungswandler	Voltage transformer		24V DC - 230V DC	034322401Z7
A1	Touchsteuerung	Touch control			03432240A1
A2	Steuerbox	Control box			03432240A2
EL	Maschinenlampe	Maschine lamp		LED 24V	03432240EL
FR1	Motorschutzschalter	Motor protection switch		Siemens 3UA59/ 10-16A	03432240FR1
FR2	Motorschutzschalter	Motor protection switch		Siemens 3UA59/ 0,25-0,4A	03432240FR2
K1	Steuerrelais	Control relay		Schneider RSB1A120BD	03432240K1
K2	Steuerrelais	Control relay		Schneider RSB1A120BD	03432240K1
KA0	Steuerrelais	Control relay		Schneider RXM4AB2BD	03432240KA0
KA1	Schütz Kühlmittelpumpe	Coolant pump contactor		Siemens 3TH40	03432240KA1
KM1	Motorschütz Spindel Vorwärts	Spindle clockwise rotation contactor		Siemens 3TS33	03432240KM1
KM2	Motorschütz Spindel Rückwärts	Spindle counter clockwise rotation contactor		Siemens 3TS33	03432240KM1
KM3	Schütz Spindel langsam	Spindel low rotation contactor		Siemens 3TS33	03432240KM1
KM4	Schütz Spindel schnell	Spindle hi rotation contactor		Siemens 3TS33	03432240KM1
KM5	Schütz Sternanlauf	Star run contactor		Siemens 3TS33	03432240KM1
M1	Antriebsmotor zweistufig	Two-stage motor		YD132M-8/4, 3-4,5kW	03432240M1
M2	Motor Kühlmittelpumpe	Coolant pump motor		AB25, 40W	03432240M2
QM1	Sicherungsautomat	Automatical fuse		Schneider DZ451-63/3PC30	03432240QM1
QM2	Sicherungsautomat	Automatical fuse		Schneider DZ451-63/3PD1	03432240QM2
QM3	Sicherungsautomat	Automatical fuse		Schneider DZ451-63/1PC5	03432240QM3
QM4	Sicherungsautomat	Automatical fuse		Schneider DTZ451-62/1PC3	03432240QM4
S	Hauptschalter	Main switch		LW8GS	03432240S
SB01	Not-Halt Schlagschalter	Emergency- stop button		ABB CE4T-10R-02	03432240SB01
SB02	Schalter Riemenabdeckung	Belt cover switch		Kedu QKS8	03432240SB02
SB1	Taster Direktlauf	Direct run button		ABB CP1-10B-11	SB103432240
SQ2	Schalter Drehfutterschutz	Lathe chuck safety switch		KEDU QKS7	03432240SQ2
SQ4	Endschalter Drehrichtung	Position rotary switch		KEDU QKS7	03432240SQ2
SQ5	Endschalter Drehrichtung	Position rotary switch		KEDU QKS7	03432240SQ2
T	Zeitrelais	Time relay		E&E ST3PA-S	03432240T
TC	Netzteil	Power pack		Delta DRP0-24V/120W	03432240TC

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Schmierstoffe Lubricant Lubrifiant	Viskosität Viskosity Viscosité ISO VG DIN 51519 mm²/s (cSt)	Kennzeich- nung nach DIN 51502	ARAL	BP	Esso	KLÜBER LUBRICATION	Mobil		TEXACO
Getriebeöl Gear oil Huile de réducteur	VG 680	CLP 680	Aral Degol BG 680	BP Energol GR-XP 680	SPARTAN EP 680	Klüberoil GEM 1-680	Mobilgear 636	Shell Omala S2 GX 680	Meropa 680
	VG 460	CLP 460	Aral Degol BG 460	BP Energol GR-XP 460	SPARTAN EP 460	Klüberoil GEM 1-460	Mobilgear 634	Shell Omala S2 GX 460	Meropa 460
	VG 320	CLP 320	Aral Degol BG 320	BP Energol GR-XP 320	SPARTAN EP 320	Klüberoil GEM 1-320	Mobilgear 632	Shell Omala S2 GX 320	Meropa 320
	VG 220	CLP 220	Aral Degol BG 220	BP Energol GR-XP 220	SPARTAN EP 220	Klüberoil GEM 1-220	Mobilgear 630	Shell Omala S2 GX 220	Meropa 220
	VG 150	CLP 150	Aral Degol BG 150	BP Energol GR-XP 150	SPARTAN EP 150	Klüberoil GEM 1-150	Mobilgear 629	Shell Omala S2 GX 150	Meropa 150
	VG 100	CLP 100	Aral Degol BG 100	BP Energol GR-XP 100	SPARTAN EP 100	Klüberoil GEM 1-100	Mobilgear 627	Shell Omala S2 GX100	Meropa 100
	VG 68	CLP 68	Aral Degol BG 68	BP Energol GR-XP 68	SPARTAN EP 68	Klüberoil GEM 1-68	Mobilgear 626	Shell Omala S2 GX 68	Meropa 68
	VG 46	CLP 46	Aral Degol BG 46	BP Bartran 46	NUTO H 46 (HLP 46)	Klüberoil GEM 1-46	Mobil DTE 25	Shell Tellus S2 MX 46	Anubia EP 46
	VG 32	CLP 32	Aral Degol BG 32	BP Bartran 32	NUTO H 32 (HLP 32)	Klübersynth GEM 4- 32 N	Mobil DTE 24	Shell Tellus S2 MX 32	Anubia EP 32
Hydrauliköl Hydraulic oil Huile hydraulique	VG 32	CLP 32	Aral Vitam GF 32	BP Energol HLP HM 32	NUTO H 32 (HLP 32)	LAMORA HLP 32	Mobil Nuto HLP 32	Shell Tellus S2 M 32	Rando HD HLP 32
	VG 46	CLP 46	Aral Vitam GF 46	BP Energol HLP HM 46	NUTO H 46 (HLP 46)	LAMORA HLP 46	Mobil Nuto HLP 46	Shell Tellus S2 M 46	Rando HD HLP 46
Getriebefett Gear grease Graisse de réducteur		G 00 H-20	Aral FDP 00 (Na-verseift) Aralub MFL 00 (Li-verseift)	BP Energrease PR-EP 00	FIBRAX EP 370 (Na-verseift)	MICROL-UBE GB 00	Mobilux EP 004	Shell Alva-nia GL 00 (Li-verseift)	Marfak 00

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Spezialfette, wasserabweisend Special greases, water resistant Graisses spéciales, déperlant			Aral Aralub	Energrease PR 9143		ALTEMP Q NB 50 Klüberpaste ME 31-52	Mobilux EP 0 Mobil Greas-erex 47		
Wälzlagerfett Bearing grease Graisse de roulement		K 3 K-20 (Li-verseift)	Aralub HL 3	BP Energrease LS 3	BEACON 3	CEN-TOPLEX 3	Mobilux 3	Shell Alva-nia R 3 Alva-nia G 3	Multifak Pre-mium 3
Öle für Gleitbahnen Oils for slideways Huiles pour glissières	VG 68	CGLP 68	Aral Deganit BWX 68	BP Maccurat D68	ESSO Febis K68	LAMORA D 68	Mobil Vactra Oil No.2	Shell Tonna S2 M 68	Way lubri-cant X 68
Öle für Hochfrequenzspin-deln Oils for Built-in spindles Huiles pour broches à haute vitesse	VG 68		Deol BG 68	Emergol HLP-D68	Spartan EP 68		Drucköl KLP 68-C	Shell Omala 68	
Fett für spezielle Schmi-erungen an CNC Werkzeu-gmaschinen (Fließfett) Grease for special lubrica-tion on CNC machine tools Graisse pour lubrification spéciale sur machines-out-ils CNC	NLGI Klasse 000 NLGI class 000		ARALUB BAB 000	Grease EP 000	Shell Gadus S4 V45AC	CEN-TOPLEX GLP 500	Mobilux EP 023		Multifak 264 EP 000
Fett für Hochfrequenzspin-deln Grease for Built-in spindles Graisse pour broches à haute vitesse	METAFLUX-Fett-Paste (Grease paste) Nr. 70-8508 METAFLUX-Moly-Spray Nr. 70-82 Techno Service GmbH ; Detmolder Strasse 515 ; D-33605 Bielefeld ; (++49) 0521- 924440 ; www.metaflux-ts.de								
Kühlschmiermittel Cooling lubricants Lubrifiants de refroidisse-ment			Aral Emusol	BP Sevora	Esso Kutwell		Mobilcut	Shell Adrana	Chevron Sol-uble Oil B

8 Malfunctions

8.1 Machine

Malfunction	Cause/ possible effects	Solution
Machine does not turn on	o Position switch lathe chuck protection machine switches off o Position switch protection cover headstock machine switches off o EMERGENCY-STOP mushroom switch activated o Engine protective switch released o 24V control transformer is defective	o Check position switch lathe chuck protection, adjust o Check or adjust the position switch of protective cover headstock. o EMERGENCY-STOP mushroom switch unlock o Check motor protection switch o Check transformer
Machine illumination does not work	o Control transformer is defective o Check machine illumination o Faulty control unit keypad or button	o Replace the transformer o Replace machine illumination o Check control unit keypad and button
Motor hums Motor is hot Motor has no power	o Machine connected incorrectly	o Have it checked by qualified
Feed will stop	o Feed force > 5000N o Drop worm in the apron triggers o Change gear bar not engaged	o Reduce feed force o Setting the feed, ► Feed force, turning till dog on page 37 o Check change gear bar ► „Img.4-11: Change gear bar, metric combination“ on page 51
Braking efficiency drive motor has decreased	o DC brake ineffective, set point brake: Active after 4 seconds after switching off the spindle drive.	o Have it checked by qualified o Check the AC - DC converter in the control cabinet and replace it if necessary . o Check the clock timer in the control cabinet and replace it if necessary .
No feed rate for threading	o Lead screw does not rotate o Change gear bar not engaged	o Intended breaking, shear pin on the lead screw o Check change gear bar o ► Replacement of the shear pin on the lead screw on page 75
Gear positions on feed gear can not be switched Gear is switchable, but no feed	o Sliding gear drive feed o Change gear bar not engaged	o Check shift pins in the feed gear o Check change gear bar o Have it checked by qualified
Surface of workpiece too rough	o Lathe tool blunt o Lathe tool springs o Feed too high o Radius at lathe tool tip too small	o Resharpen lathe tool o Clamp lathe tool with less overhang o Reduce feed o Increase radius

Malfunction	Cause/ possible effects	Solution
V-belt squeaks V-belt slips	o V-belt wear down o V-belt tension is too loose	o ► Tighten the V-belt on page 74
Digital Position Indicator DP700	o http://www.newall.co.uk/support/downloads/digital_readouts/	
Cooling lubricant runs out of the bar passage of the rotary spindle	o Cooling lubricant collector clogged, clogged hose	o ► Cleaning the coolant tray on page 75
Cooling lubricant running onto the ground	o Slotted screen at the outlet o Drain hoses	o Clean slotted screen in the chip tray o Note cooling lubricant dosage o Clogged drain hoses
Workpiece becomes conical	o Centre are not aligned (tailstock offset) o Top slide is not exactly set to zero (when turning with the top slide)	o Align the tailstock to the center o Align the top slide exactly
Lathe rattles	o Feed too high o Main bearings have clearance	o Reduce feed o Have the main bearings readjusted
Center runs hot	o Workpiece has expanded	o Loosen tailstock center
Lathe tool has a short service life	o Cutting speed too high o For large infeed o Insufficient cooling	o Reduce cutting speed o Lower delivery / finishing stock allowance not over 0.5 mm) o More cooling
Flank wear too high	o Clearance angle too small (lathe tool "pushes") o Lathe tool tip not adjusted to centre height	o Increase clearance angle o Correct height adjustment of the lathe tool
Cutting edge breaks off	o Wedge angle too small (heat buildup) o Grinding cracks due to improper cooling o Excessive play in the spindle bearings (oscillations occur)	o Set greater wedge angle o Cool uniformly o Have the clearance in the spindle bearing arrangement re-adjusted
Turned threaded is wrong	o Lathe tool is clamped incorrectly or grinding has been started the wrong way o Wrong pitch o Wrong diameter	o Set the lathe tool to the centre, grind angle correctly Use 60° lathe tool for metric threads, 55° lathe tool for inch thread o Adjust right pitch o Turn the workpiece to the correct diameter

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9 Appendix

9.1 Copyright

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Subject to technical changes without notice.

9.2 Terminology/Glossary

Term	Explanation
Headstock	Housing for the feed gear and the speed gear.
Lead screw nut	Split nut which engages the lead screw.
Lathe chuck	Clamping tool for holding the workpiece.
Drill chuck	Drill bit adapter
Lathe saddle	Slide on the slideway of the machine bed which feeds parallel to the tool axis.
Cross slide	Slide on the slideway of the machine bed which feeds parallel to the tool axis.
Top slide	Swivelling slide on the cross slide.
Taper mandrel	Taper of the drill bit, the drill chuck or the centering point.
Tool	Lathe tool, drill bit, etc.
Workpiece	Piece to be turned or machined.
Tailstock	Movable turning aid.
Rest	Follow or steady support for turning long workpieces.
Lathe dog	Device or clamping aid for driving pieces to be turned between centres.
Threading gauge	Help with thread cutting

9.3 Change information manual

Chapter	Short note	new version no.
all	Update cross-references	1.0.1
4.18.2	Feed at high speed deactivated	1.0.2
4.19	Table updated	1.0.3
3	interdepartmental transport	1.0.4
	Newall replaced with DPA32	1.0.5
parts	Chip guard eaves plate	1.0.6
	DPA32 replaced with DPA31Plus	1.0.7

9.4 Liability claims/warranty

Besides the legal liability claims for defects of the customer towards the seller, the manufacturer of the product, OPTIMUM GmbH, Robert-Pfleger-Straße 26, D-96103 Hallstadt, does not grant any further warranties unless they are listed below or were promised as part of a single contractual provision.

- O Liability or warranty claims are processed at OPTIMUM GmbH's discretion either directly or through one of its dealers.
  Any defective products or components of such products will either be repaired or replaced by components which are free from defects. Title to replaced products or components is transferred to us.
- O The automatically generated original proof of purchase which shows the date of purchase, the type of machine and the serial number, if applicable, is the precondition in order to assert liability or warranty claims. If the original proof of purchase is not presented, we are not able to perform any services.
- O Defects resulting from the following circumstances are excluded from liability and warranty claims:
  - Using the product beyond the technical options and proper use, in particular due to overstraining of the machine.
  - Any defects arising by one's own fault due to faulty operations or if the operating manual is disregarded.
  - Inattentive or incorrect handling and use of improper equipment
  - Unauthorized modifications and repairs
  - Insufficient installation and safeguarding of the machine
  - Disregarding the installation requirements and conditions of use
  - atmospheric discharges, overvoltage and lightning strokes as well as chemical influences
- O The following items are also not subject to liability or warranty claims:
  - Wearing parts and components which are subject to a standard wear as intended such as e.g. V-belts, ball bearings, illuminants, filters, sealings, etc.
  - Non reproducible software errors
- O Any services, which OPTIMUM GmbH or one of its agents performs in order to fulfil any additional warranty are neither an acceptance of the defects nor an acceptance of its obligation to compensate. These services neither delay nor interrupt the warranty period.
- O The court of jurisdiction for legal disputes between businessmen is Bamberg.
- O If any of the aforementioned agreements is totally or partially inoperative and/or invalid, a provision which nearest approaches the intent of the guarantor and remains within the framework of the limits of liability and warranty which are specified by this contract is deemed agreed.

9.5 Storage

ATTENTION!

Incorrect and improper storage might result in damage or destruction of electrical and mechanical machine components.

Store packed and unpacked parts only under the intended environmental conditions.

Follow the instructions and information on the transport box:

- Fragile goods
  (Goods require careful handling)

- Protect against moisture and humid environment

- Prescribed position of the packing case
  (Marking the top surface - arrows pointing up)

- Maximum stacking height

Example: not stackable - do not stack further packing case on top of the first one.

Consult Optimum Maschinen Germany GmbH if the machine and accessories are stored for more than three months or are stored under different environmental conditions than those specified here .

9.6 Dismantling, disassembling, packing and loading

INFORMATION

Please take care in your interest and in the interest of the environment that all component parts of the machine are only disposed of in the intended and admitted way.

Please note that the electrical devices comprise a variety of reusable materials as well as environmentally hazardous components. Please ensure that these components are disposed of separately and professionally. In case of doubt, please contact your municipal waste management. If appropriate, call on the help of a specialist waste disposal company for the treatment of the material.

Please make sure that electrical components are disposed of professionally and in accordance with the statutory provisions.

The machine contains electrical and electronic components and must not be disposed of as household waste. According to the European directive 2002/96/EG regarding disused electrical and electronic devices and the implementation in national law, disused electrical tools and electrical equipment must be stored separately and recycled in an environmentally friendly manner.

As the equipment operator, you should obtain information regarding the authorized collection or disposal system which applies for your company.

Please make sure that electrical components are disposed of professionally and in accordance with legal regulations. Please only dispose of used batteries via the collection boxes in shops or at municipal waste management companies.

9.6.1 Decommissioning

CAUTION!

Disused machines need to be decommissioned in a professional manner in order to avoid later misuse and endangerment of the environment or persons.

- **o Disassemble the machine if required into easy-to-handle and reusable assemblies and component parts.**
- **o Dispose of machine components and operating fluids using the intended disposal methods.**

9.6.2 Dismantling

→ Pull the power cord or disassemble the connection cable and disconnect the connection cable.

9.6.3 Disassembly

→ Drain the oil

- O from the headstock, drain hole
- O from the feed gear, drain hole
- O from the apron, drain hole.

→ Drain the cooling lubricant

→ Disassemble the drive motor

9.6.4 Packing and loading

→ Place the machine on 2 palettes to allow for removal transport

9.7 Disposal of new device packaging

All used packaging materials and packaging aids from the machine are recyclable and generally need to be supplied to the material reuse.

The packaging wood can be supplied to the disposal or the reuse.

Any packaging components made of cardboard box can be chopped up and supplied to the waste paper collection.

The films are made of polyethylene (PE) and the cushion parts are made of polystyrene (PS). These materials can be reused after reconditioning if they are passed to a collection station or to the appropriate waste management enterprise.

Only forward the packaging materials correctly sorted to allow direct reuse.

9.8 Disposal of lubricants and cooling lubricants

ATTENTION!

Please imperatively make sure to dispose of the used coolant and lubricants in an environmentally compatible manner. Observe the disposal instructions of your municipal waste management companies.

INFORMATION

Used coolant emulsions and oils should not be mixed since it is only possible to reuse oils without pre-treatment when they have not been mixed.

The disposal instructions for used lubricants are made available by the manufacturer of the lubricants. If necessary, request the product-specific data sheets.

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9.9 Disposal via municipal collection facilities

Disposal of used electrical and electronic components
(Applicable in the countries of the European Union and other European countries with a separate collecting system for those devices).

The sign on the product or on its packing indicates that the product must not be handled as common household waste, but that is needs to be disposed of at a central collection point for recycling. Your contribution to the correct disposal of this product will protect the environment and the public health. Incorrect disposal constitutes a risk to the environment and public health. Recycling of material will help reduce the consumption of raw materials. For further information about the recycling of this product, please consult your District Office, municipal waste collection station or the shop where you have purchased the product.

9.10 Product follow-up

We are required to perform a follow-up service for our products which extends beyond shipment.

We would be grateful if you could send us the following information:

- Modified settings
- Any experiences with the lathe which might be important for other users
- Recurring malfunctions

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OPTIMUM®
MASCHINEN - GERMANY

EC - Declaration of Conformity

according to Machinery Regulation 2023/1230 Annex V Part A

The manufacturer / distributor Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D - 96103 Hallstadt, Germany

hereby declares that the following product

Product designation: Hand controlled lathe

Type designation: TZ4

fulfils all the relevant provisions of the Machinery Regulation specified above and the additionally applied directives (in the following) - including the changes which applied at the time of the declaration.

Description:

Hand controlled lathe without numerical control

The following other EU Directives have been applied:

EMC Directive 2014/30/EC ; Restriction of the use of certain hazardous substances in electrical and electronic equipment 2015/863/EU

The following harmonized standards were applied:

EN ISO 23125: 2015-04 Machine tools - Safety - Turning machines

EN 60204-1: 2019-06 Safety of machinery - Electrical equipment of machines - Part 1: General requirements

EN ISO 13849-1: 2016-06 Safety of machinery - Safety related parts of controls - Part 1: General design principles

EN ISO 13849-2: 2013-02 Safety of machinery - Safety related parts of controls - Part 2: Validation

EN ISO 12100: 2011-03 Safety of machinery - General principles for design - Risk assessment and risk reduction

Name and address of the person authorized to compile the technical file:

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Kilian Stürmer (CEO, General Manager)
Hallstadt, 2023-11-08

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